VOLUME 24 / NUMBER 10
MAY 23, 1986
ACC. NOS. N86-19281 TO N86-20340

STAR
AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

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Scientific and Technical Aerospace Reports, Volume 24, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by RMS Associates.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 22, 1988.

US ISSN 0036-8741

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For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **1680**

89 ASTRONOMY **1696**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1698**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1700**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1701**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1702**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **N.A.**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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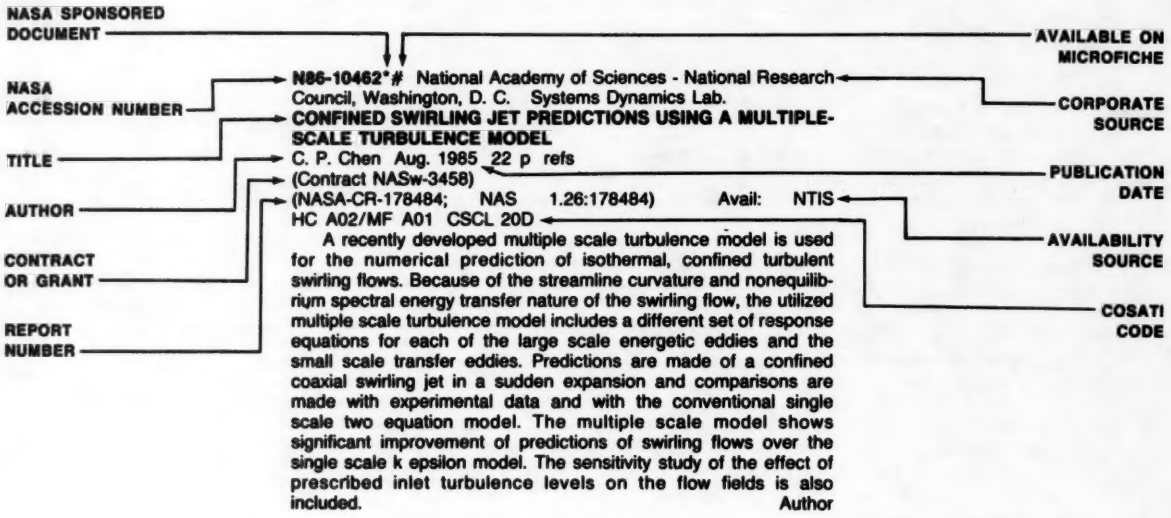
TYPICAL CITATION AND ABSTRACT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COSATI CODE
N86-10462*# National Academy of Sciences - National Research Council, Washington, D. C. Systems Dynamics Lab.
CONFINED SWIRLING JET PREDICTIONS USING A MULTIPLE-SCALE TURBULENCE MODEL
C. P. Chen Aug. 1985 22 p refs
(Contract NASw-3458)
(NASA-CR-178484; NAS 1.26:178484) Avail: NTIS
HC A02/MF A01 CSCL 20D
A recently developed multiple scale turbulence model is used for the numerical prediction of isothermal, confined turbulent swirling flows. Because of the streamline curvature and nonequilibrium spectral energy transfer nature of the swirling flow, the utilized multiple scale turbulence model includes a different set of response equations for each of the large scale energetic eddies and the small scale transfer eddies. Predictions are made of a confined coaxial swirling jet in a sudden expansion and comparisons are made with experimental data and with the conventional single scale two equation model. The multiple scale model shows significant improvement of predictions of swirling flows over the single scale k epsilon model. The sensitivity study of the effect of prescribed inlet turbulence levels on the flow fields is also included.
Author

VOLUME 24 NUMBER 10 / MAY 23, 1986

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N86-19281* National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 195)
Jan. 1986 113 p
(NASA-SP-7037(195); NAS 1.21:7037(195)) Avail: NTIS HC A06 CSCL 01A

This bibliography lists 389 reports, articles and other documents introduced into the NASA scientific and technical information system in December 1985. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N86-19282 Illinois Univ., Urbana-Champaign.
FLUCTUATING PRESSURE AND VELOCITY FIELDS IN THE NEAR FIELD OF A ROUND JET Ph.D. Thesis
Paul Hsin-Pei Chang 1985 216 p
Avail: Univ. Microfilms Order No. DA8521737

A new analysis algorithm for analyzing signals of a triple-wire anemometer probe is presented which describes the performance of the hot-wire probe and shows the ambiguity in interpretation of the three effective cooling velocities for a range of flow vector directions. Jorgensen's (1971) cooling law for cylinders inclined to the flow vector is adopted. Inverted velocity vectors are multiple but a uniqueness domain, within which the vector coinciding with the true velocity vector can be singled out, is defined. Samples of linearized voltages were taken in the turbulent shear layer of a 6.35 cm diameter jet and analyzed by the algorithm. The results appear to support the methodology of the algorithm. The mechanisms that cause some of the samples to reside outside the realizable domain are discussed. A dynamic test in terms of pressure-velocity correlation in an unsteady irrotational flow was performed for the bleed-type pressure transducer. Pressure-velocity correlations calculated from the unsteady Bernoulli equation agree closely with direct measurements with the pressure transducer. Dissert. Abstr.

N86-19283 Purdue Univ., West Lafayette, Ind.
AN EXPERIMENTAL INVESTIGATION OF PROPELLER WAKES USING A LASER DOPPLER VELOCIMETER Ph.D. Thesis
R. M. Sundar 1985 196 p
Avail: Univ. Microfilms Order No. DA8520081

This report presents a detailed investigation of the performance and flowfield of three single rotation propellers. These propellers were designed to demonstrate the efficiency improvements attainable by using propiets and bibiades. Direct measurement of thrust by a parallelogram balance and power by measuring the input to the propulsion unit (dc motor) was used to determine the efficiency of the propellers. The force measurements demonstrated that the use of propiets did produce an efficiency improvement under high loading conditions in static operation as well as with forward speed. The improvement in static thrust by using propiets was comparable with that of a shrouded propeller. The flow field in the wake of the propellers was investigated with an LDV system. The measured velocity field is compared with the theoretical velocity field. Biot-Savarts' law was applied to the theoretically assumed vortex geometry in the wake to determine the theoretical velocity field. Dissert. Abstr.

N86-19284# Committee on Science and Technology (U. S. House).
HIGH SPEED AERONAUTICS
Washington GPO 1985 195 p Hearing before the Subcommittee on Transportation, Aviation and Materials of the Committee on Science and Technology, 99th Congress, 1st Session, no. 21, 24 Jul. 1985
(GPO-51-341) Avail: Subcommittee on Transportation, Aviation and Materials

Testimonies on the research and development of hypersonic speed aviation is presented. The effect of high speed aircraft on space flight is noted. The need to press forward in this research in order to keep up with other countries is emphasized. Budgetary requirements are also considered. E.R.

N86-19285# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
ANALYSIS OF EXPERIMENTAL DATA FOR A 21% THICK NATURAL LAMINAR FLOW AIRFOIL, NAE68-060-21:1
D. J. Jones and M. Khalid Oct. 1985 56 p refs
(NAE-AN-34; NRC-25076) Avail: NTIS HC A04/MF A01

Results obtained from wind tunnel tests on a 21% thick supercritical airfoil capable of sustaining long runs of laminar flow on both surfaces are presented. The measured drag levels are superior to those of any model previously tested in this facility and are comparable to classical NACA and modern NASA NLF airfoils. Author

N86-19286# National Aerospace Lab., Tokyo (Japan).
AERODYNAMIC TRANSFER FUNCTIONS FOR A FINITE WING IN INCOMPRESSIBLE FLOW
Hiroshi Matsushita 1985 58 p refs In JAPANESE; ENGLISH summary
(NAL-TR-867; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

The aerodynamic transfer functions for a wing with a control surface in an incompressible flow are presented analytically using Laplace transform technique. The aerodynamic transfer function for an airfoil can be analytically represented with the generalized Theodorsen function as circulatory parts and the rational function as noncirculatory parts. The aerodynamic transfer function for a finite wing is obtained in a closed form which includes the

nonrational function called a modified circulation. A modified circulation function shows a finite wing effect and is governed by an integro-differential equation, which can be solved efficiently by numerical computation. These results extend the simple harmonic theory to a general transient motion. With the expression thus obtained, the characteristics of the aerodynamic transfer function for a finite wing clearly show that it should have a branch point at the origin and have no singularities along the negative real axis. Transient aerodynamic forces in time domain such as an indicial lifts are obtained by inverse Laplace transforming the present results. Comparison of these results with the other methods and the experimental values shows a good agreement. Author

N86-19287*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LOW-SPEED WIND-TUNNEL INVESTIGATION OF THE EFFECT OF STRAKES AND NOSE MACHINES ON LATERAL-DIRECTIONAL STABILITY OF A FIGHTER CONFIGURATION

Jay M. Brandon Washington Feb. 1986 33 p refs
(NASA-TM-87641; L-16051; NAS 1.15:87641) Avail: NTIS HC A03/MF A01 CSCL 01A

A series of low-speed static wind-tunnel force tests were conducted on a 0.15-scale model of a modern high-performance fighter aircraft. The tests identified the use of nose chines to enhance stability at high angles of attack. Results of this investigation showed that the strake was the major contributor to directional instability. The destabilizing forces were created by two mechanisms: (1) adverse flow in the region of the vertical tail, and (2) forces generated on the fuselage ahead of the center of gravity. Properly designed nose chines effectively negated the adverse flow near the vertical tail and created stabilizing forces on the forebody in the range of the stall angle of attack. Author

N86-19288*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LOADS AND AEROELASTICITY DIVISION RESEARCH AND TECHNOLOGY ACCOMPLISHMENTS FOR FY 1985 AND PLANS FOR FY 1986

J. E. Gardner and S. C. Dixon Jan. 1986 125 p
(NASA-TM-87676; NAS 1.15:87676) Avail: NTIS HC A06/MF A01 CSCL 01A

The Langley Research Center Loads and Aeroelasticity Division's research accomplishments for FY85 and research plans for FY86 are presented. The rk under each branch (technical area) will be described in terms of highlights of accomplishments during the past year and highlights of plans for the current year as they relate to five year plans for each technical area. This information will be useful in program coordination with other government organizations and industry in areas of mutual interest. Author

N86-19289*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A TWO-DIMENSIONAL NUMERICAL STUDY OF THE FLOW INSIDE THE COMBUSTION CHAMBERS OF A MOTORED ROTARY ENGINE

T. I.-P. Shih (Florida Univ., Gainesville), S. L. Yang (Florida Univ., Gainesville), and H. J. Schock 1986 16 p refs Presented at the SAE International Congress and Exposition, Detroit, Mich., 24-28 Feb. 1986
(Grant NAG3-363)
(NASA-TM-87212; E-2871; NAS 1.15:87212; SAE-860615) Avail: NTIS HC A02/MF A01 CSCL 01A

A numerical study was performed to investigate the unsteady, multidimensional flow inside the combustion chambers of an idealized, two-dimensional, rotary engine under motored conditions. The numerical study was based on the time-dependent, two-dimensional, density-weighted, ensemble-averaged conservation equations of mass, species, momentum, and total energy valid for two-component ideal gas mixtures. The ensemble-averaged conservation equations were closed by a K-epsilon model of turbulence. This K-epsilon model of turbulence was modified to account for some of the effects of compressibility, streamline curvature, low-Reynolds number, and preferential stress dissipation. Numerical solutions to the conservation equations were obtained by the highly efficient implicit-factored method of Beam and Warming. The grid system needed to obtain solutions were generated by an algebraic grid generation technique based on transfinite interpolation. Results of the numerical study are presented in graphical form illustrating the flow patterns during intake, compression, gaseous fuel injection, expansion, and exhaust. Author

N86-19290*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF AREA RATIO ON THE PERFORMANCE OF A 5.5:1 PRESSURE RATIO CENTRIFUGAL IMPELLER

Lawrence F. Schumann (Army Aviation Research and Technology Activity, Cleveland, Ohio), David A. Clark (Army Aviation Research and Technology Activity, Cleveland, Ohio), and Jerry R. Wood 1986 40 p refs Proposed for presentation at the 31st International Gas Turbine Conference and Exhibition, Dusseldorf, West Germany, 8-12 Jun. 1986; sponsored by the American Society of Mechanical Engineers
(NASA-TM-87237; E-2190; NAS 1.15:87237; USAAVSCOM-TR-85-C-21; TR-85-C-21) Avail: NTIS HC A03/MF A01 CSCL 01A

A centrifugal impeller which was initially designed for a pressure ratio of approximately 5.5 and a mass flow rate of 0.959 kg/sec was tested with a vaneless diffuser for a range of design point impeller area ratios from 2.322 to 2.945. The impeller area ratio was changed by successively cutting back the impeller exit axial width from an initial value of 7.57 mm to a final value of 5.97 mm. In all, four separate area ratios were tested. For each area ratio a series of impeller exit axial clearances was also tested. Test results are based on impeller exit surveys of total pressure, total temperature, and flow angle at a radius 1.115 times the impeller exit radius. Results of the tests at design speed, peak efficiency, and an exit tip clearance of 8 percent of exit blade height show that the impeller equivalent pressure recovery coefficient peaked at a design point area ratio of approximately 2.748 while the impeller aerodynamic efficiency peaked at a lower value of area ratio of approximately 2.55. The variation of impeller efficiency with clearance showed expected trends with a loss of approximately 0.4 points in impeller efficiency for each percent increase in exit axial tip clearance for all impellers tested. Author

N86-19291# Naval Surface Weapons Center, Silver Spring, Md.

GENERATION OF THE STARTING PLANE FLOWFIELD FOR SUPERSONIC FLOW OVER A SPHERICALLY CAPPED BODY

T. Hsieh and F. J. Priolo 9 May 1985 286 p
(AD-A161117; NSWC/TR-84-484) Avail: NTIS HC A13/MF A01 CSCL 20/4

This report describes a fast method to provide a three dimensional starting flowfield to be used in a space-marching-type calculation for the afterbody flowfield of spherically capped missiles at incidence in supersonic flight speed. Utilizing the property of spherical symmetry of the flowfield about a sphere, three dimensional starting plane flowfield may be interpolated from the results of an axisymmetric flowfield about a sphere, which is available from an existing computer program (NOSTIP) with considerably less computing time. The analysis of the interpolation method, examples and listings of computer programs for the axisymmetric and the three dimensional starting plane flowfields about a sphere in the Mach number range from 1.5 to 10 and angle of attack between 0 to 35 degrees are presented.
Author (GRA)

N86-19292# National Aeronautical Establishment, Ottawa (Ontario).

WIND TUNNEL CALIBRATION OF A PMS (PARTICLE MEASURING SYSTEMS) CANISTER INSTRUMENTED FOR AIRFLOW MEASUREMENT

J. I. MacPherson Sep. 1985 64 p
(AD-A161124; NAE-AN-32; NRC-24922) Avail: NTIS HC A04/MF A01 CSCL 20/6

Measurements of cloud particle images and concentrations using laser spectrometers housed in pods mounted on the wings or fuselages of research aircraft can be affected by the distortion of the airflow about the aircraft. The Flight Research Laboratory has developed a pod with a Rosemount 858 5-hole probe and pressure transducers to measure airflow angles and velocities at typical mounting locations on cloud physics research aircraft. This report documents the results of an extensive wind tunnel calibration of this pod to determine the factors relating the differential pressure measurements to the flow angles and velocities, and in particular to account for the effects of the canister itself on these measurements. Author (GRA)

N86-19293# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ON THE SEPARATED FLOW OVER A DELTA WING AT HIGH SUBSONIC AND TRANSONIC SPEEDS
J. A. Moeller, W. J. Bannik, and P. G. Bakker Dec. 1984 16 p refs Original contains color illustrations
(VTH-M-527) Avail: NTIS HC A02/MF A01

Wind tunnel results on the separated flow over a delta wing at high subsonic Mach numbers (0.55 to 0.85) were obtained for the validation of computer codes based on the Euler flow quations. The two models tested were of the same planform with flat upper surfaces and sharp leading edges, and cropped delta wings with 65 deg leading edge sweep. The larger model had a fuselage extending in front of the wing apex. It was used to study the flow by means of surface oil flow visualization, Schlieren pictures, and 5 hole directional probe flow field surveys at angles of incidence of 0, 5, 15, and 20 deg. With the smaller model, that had no fuselage, vortex breakdown was studied by Schlieren pictures. This model could reach a maximum angle of incidence of 35 deg.
Author (ESA)

N86-19294# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ELEMENTS OF THE AERODYNAMIC THEORY OF CYCLOGYRO WING SYSTEMS WITH CONCENTRATOR EFFECTS
R. Coene Oct. 1983 91 p refs
(VTH-LR-338) Avail: NTIS HC A05/MF A01

The fluid dynamics of cyclogyro wing systems are analyzed, based on two-dimensional potential flow theory. General expressions for flows associated with circular distributions of bound vorticity are derived. The forces and moments exerted by the flow on the bound vortices are calculated in their relation with the mass flux and the ground effect. The mean flows generated by wings with constant circulation are used as the environment in which energy exchange related to the shedding of vorticity can take place efficiently. Concentrator effects in the propeller and the turbine case are emphasized. For a wing system operating as a turbine with concentrator effects, the Lanchester-Betz limit for the conversion efficiency, 16/17, is invalid and can be increased. Wing systems operating as a propeller can generate thrust more efficiently when concentrator effects occur. Author (ESA)

N86-19295# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Research and Testing Dept.
FLOW VISUALIZATION USING MINITUFTS FOR WIND TUNNELS [SICHTBARMACHUNG DER STROEMUNG DURCH MINITUFTS FUER WINDKANAELE]
Bernard Zurschmitten 10 Dec. 1984 11 p In GEORGIAN
(F+W-FO-1753) Avail: NTIS HC A02/MF A01

A method for visualization of the flow on and around a model in wind tunnel aerodynamic investigations was developed. Fine Nylon 66 monofilaments colored with fluorescent formic acid were stuck to a rudder configuration illuminated with UV photoflash lamps. The filaments were photographed with a lens equipped with a UV filter. The use of a videocamera for flow photography is discussed. Author (ESA)

N86-19296# Institut Franco-Allemand de Recherches, St. Louis (France).
DENSITY MEASUREMENTS IN A TUBE BEHIND A PROJECTILE. SIMULATION IN A SHOCK TUBE [DICHTEMESSUNGEN IM LAUF HINTER EINEM PROJEKTIL. EINE SIMULATION IM STROSSROHR]
F. Seiler 28 Nov. 1984 29 p refs In GERMAN
(Contract BMVg-T/R-760/E-0007/E1-707)
(ISL-CO-237/84) Avail: NTIS HC A03/MF A01

Interior ballistics flows were simulated in a high pressure shock tube. Projectiles were accelerated in a rectangular measuring tube by the high pressure of the shock wave which is frontally reflected on the projectile. The density in the gas flow behind the projectile was measured by a differential interferometer and a Michelson inteferometer. The measurements show that this differential interferometer fails in the higher pressure ranges. The gas density behind the projectile increases towards the tube wall, within a boundary layer of maximum 1 mm. The mechanisms responsible for the erosion of a gun barrel occur in this layer are discussed. Experimental results in gun barrels are not obtainable with sufficient precision or not obtainable at all due to measuring-technical reasons. Therefore, the simulation of interior ballistics flows in a so-called gun simulator is very important. These model experiments make it possible to investigate gun barrel flows under well defined conditions with known measuring methods. Author (ESA)

N86-19297# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTAL AND THEORETICAL STUDY OF INCOMPRESSIBLE FLOW AROUND A WING PROFILE WITH A SPOILER. CONTRIBUTIONS OF LASER VELOCIMETRY AND THE DVORAK METHOD Final Report [ETUDE EXPERIMENTALE ET THEORIQUE DE L'ECOULEMENT AUTOUR D'UN PROFIL D'AILE MUNI D'UN SPOILER D'EXTRADOS EN REGIME INCOMPRESSIBLE; CONTRIBUTION DE LA VELOCIMETRIE LASER ET DE LA METHODE DVORAK]
P. Meyer, G. Koerber, and R. Kauffmann 9 Jul. 1984 133 p refs In FRENCH
(Contract DRET-82-318)
(ISL-R-116/84) Avail: NTIS HC A07/MF A01

The RA16-SCI supercritical profile with spoiler was studied using two dimensional laser velocimetry. The measuring method is described. Experimental results for 3 incidences (10, 20 and 40 deg) and for a three-dimensional configuration are presented. A numerical computing method for separated flow is adapted to the spoiler case. Two types of separations are observed: a single recirculation bubble at 10 deg and the coexistence of two bubbles for 20 and 40 deg. The two components of the velocity field are obtained with good space resolution. The separated flow and the turbulent flow are described with enough detail and reproductibility. Author (ESA)

N86-19298# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT ON THE FLUID DYNAMICS PANEL SYMPOSIUM ON AERODYNAMICS AND ACOUSTICS OF PROPELLERS
Ph. Poisson-Quinton (ONERA, Chatillon, France) Jul. 1985 43 p refs
(AGARD-AR-213; ISBN-92-835-1508-0) Avail: NTIS HC A03/MF A01

The Advisory Report contains a review and evaluation of the material presented at the AGARD Fluid Dynamics Panel Symposium on Aerodynamics and Acoustics of Propellers held in Toronto, Canada, 1 to 4 October 1984. Also included are related information from other sources and an excellent discussion of the state of art of modern propeller design and performance is presented. This Advisory Report was produced at the request of the Fluid Dynamics Panel of AGARD. Author

N86-19299# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TRANSONIC UNSTEADY AERODYNAMICS AND ITS AEROELASTIC APPLICATIONS
Jun. 1985 51 p Proceedings of the 59th Meeting of the Structures and Materials Panel, Toulouse, France, 2-7 Sep. 1984

(AGARD-CP-374-Add-1; ISBN-92-835-1501-3) Avail: NTIS HC A04/MF A01

The 59th meeting of the AGARD Structures and Materials Panel (SMP) was held on 3 to 7 September 1984 in Toulouse, France. It included a specialists' conference to discuss the latest methods of predicting transonic unsteady airloads for oscillating surfaces and flutter. Also considered were aeroelastic applications, many of which were made to standard configurations selected for the SMP cooperative program. The 16 papers and the round table discussion are summarized in some detail for coordination with AGARD's Fluid Dynamics Panel and Fluid Mechanics Panel. Author

N86-19300# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TWO-DIMENSIONAL TURBULENT SEPARATED FLOW
Rogert L. Simpson (Virginia Polytechnic Inst. and State Univ., Blacksburg) and A. D. Young, ed. Jun. 1985 107 p refs
(AGARD-AG-287-Vol-1) Avail: NTIS HC A02/MF A01

Many different flow cases with nominally two-dimensional turbulent separated flow regimes are discussed. Because of intermittent flow reversal and backflow near the wall, directionally sensitive measurement techniques such as hot-wire, pulsed-wire and laser anemometry are discussed. Experimentally-observed structure of detached flows on streamlined surfaces and around sharp-edged corners is discussed for steady and unsteady incompressible and compressible cases where large-scale structures dominate the flow behavior. A number of differential and integral calculation methods are discussed. Traditional attached flow turbulence models do not describe attached flows well and methods which include experimentally-observed features of detached flow parameters seem to perform best. Author

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N86-19301*# Old Dominion Univ., Norfolk, Va. Dept. of Electrical Engineering.
DESIGN OF INFRASOUND-DETECTION SYSTEM VIA ADAPTIVE LMSTDE ALGORITHM Final Report, period ending 31 Dec. 1984
Camille S. Khalaf and John W. Stoughton Nov. 1984 139 p refs
(Contract NAS1-17099)
(NASA-CR-176531; NAS 1.26:176531) Avail: NTIS HC A07/MF A01 CSCL 01C

A proposed solution to an aviation safety problem is based on passive detection of turbulent weather phenomena through their infrasonic emission. This thesis describes a system design that is adequate for detection and bearing evaluation of infrasounds. An array of four sensors, with the appropriate hardware, is used for the detection part. Bearing evaluation is based on estimates of time delays between sensor outputs. The generalized cross correlation (GCC), as the conventional time-delay estimation (TDE) method, is first reviewed. An adaptive TDE approach, using the least mean square (LMS) algorithm, is then discussed. A comparison between the two techniques is made and the advantages of the adaptive approach are listed. The behavior of the GCC, as a Roth processor, is examined for the anticipated signals. It is shown that the Roth processor has the desired effect of sharpening the peak of the correlation function. It is also shown that the LMSTDE technique is an equivalent implementation of the Roth processor in the time domain. A LMSTDE lead-lag model, with a variable stability coefficient and a convergence criterion, is designed. Author

N86-19302# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
ENHANCED EJECTION SEAT PERFORMANCE WITH VECTORED THRUST CAPABILITY Final Report, 1 Mar. - 1 Dec. 1982
Lanny A. Jines and Edward O. Roberts Aug. 1985 110 p
(AF Proj. 2402)
(AD-A161052; AFWAL-TR-84-3026) Avail: NTIS HC A06/MF A01 CSCL 01/3

The SAFEST Computer Program and the EASIEST Computer Program were used to predict improved escape performance capabilities resulting from a vectored thrust control system. A parametric study is identified and the results described to quantitatively establish enhanced performance envelope growth of the state-of-the-art ejection seat with an advanced controllable vectored thrust propulsion capability. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N86-19303 New South Wales Univ., Kensington (Australia).
SIGNAL PROCESSING IN THE AIRBORNE RECEIVER OF THE INTERSCAN MICROWAVE LANDING SYSTEM Abstract Only
D. L. Dillon Mar. 1985 3 p
Avail: Issuing Activity

The history and evolution of microwave landing system (MLS) is reviewed. The strategy by which the various MLS functions are sequentially transmitted in accordance with a standardized signal-in-space format is described, making possible the interoperability of ground and airborne subsystems of widely differing sophistication. The meaning of MLS error, its causes and the rationale for the accuracy requirements of the MLS are discussed. The overall task to be performed by the airborne MLS subsystem and the MLS receiver are surveyed. The impact on the processing on MLS signals by interfering propagation effects is considered, together with a review of some MLS signal processing methodologies. A preferred technique is identified. The question of the required sampling rate to implement the signal processing digitally is considered, and a pulse centroid-detection algorithm is described. E.A.K.

N86-19304* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
VIDEO PROCESSOR FOR AIR TRAFFIC CONTROL BEACON SYSTEM Patent
Frank Byrne, inventor (to NASA) Issued 10 Sep. 1985 5 p Filed 28 Sep. 1982
(NASA-Case-KSC-11155-1; US-Patent-4,540,986;
US-Patent-Appl-SN-425201; US-Patent-Class-343-6.8-R) Avail: US Patent and Trademark Office CSCL 17G

A circuit is disclosed for use in a transponder located in an aircraft or the like for identifying a true side lobe suppression signal being transmitted by a ground located transmitted system. The true side lobe suppression signal includes at least pulses P1 and P2. The circuit causes the transponder to produce reply signal upon the amplitude of the P1 pulse being a predetermined ratio to said P2 pulse. The circuit includes a pair of transistors with a capacitor connected to the output of the second transistor. The pulses P1 and P2 are supplied to the base electrode of the first transistor. Pulse P1 turns on the two transistors and charges the capacitor to a predetermined level so that when the second pulse P2 arrives, it does not turn on a transistor when it is equal to or less than the first pulse P1.

Official Gazette of the U.S. Patent and Trademark Office

N86-19305# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
AUTOMATIC LANDING THROUGH THE TURBULENT PLANETARY BOUNDARY LAYER
Shangxiang Zhu Nov. 1985 305 p refs
(UTIAS-289; ISSN-0082-5255) Avail: NTIS HC A14/MF A01

A statistical approach to automatic landing in turbulent planetary boundary layer is presented which is valuable for use in aircraft design and the analysis of terminal operation safety, also useful in design of autoland systems. The linearized equations of motion for an aircraft following a glide slope and an exponential curved path in the presence of wind shear and turbulence are developed. The effects of gust gradients on the motion were considered. The wind is modeled as a multi-dimensional random process, characterized by the mean wind shear and the turbulence. In the planetary boundary layer the mean wind is adequately described by a power law and by Weibull wind speed distribution. The turbulence is assumed locally isotropic. The modified von Karman model adequately represents correlations along an approach-flare trajectory. The forces and moments are considered to depend linearly on uniform gust and gust gradient components which are obtained by Etkin's four-point method which utilizes the air velocity at 4 points on the aircraft. As a test base, an autopilot of a jet transport for the approach and flare was designed. The Random Choice Direct Search technique was employed to find a set of optimal feedback gains for the auto-flare control system.
Author

N86-19306*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH DYNAMIC GPS RECEIVER VALIDATION DEMONSTRATION Final Report
William J. Hurd, Joseph I. Statman, and Victor A. Vilnrotter 31 Oct. 1985 208 p refs
(Contract NAS7-918)
(NASA-CR-176530; JPL-Pub-85-74; NAS 1.26:176530) Avail: NTIS HC A10/MF A01 CSCL 17G

The Validation Demonstration establishes that the high dynamic Global Positioning System (GPS) receiver concept developed at JPL meets the dynamic tracking requirements for range instrumentation of missiles and drones. It was demonstrated that the receiver can track the pseudorange and pseudorange rate of vehicles with acceleration in excess of 100 g and jerk in excess of 100 g/s, dynamics ten times more severe than specified for conventional High Dynamic GPS receivers. These results and analytic extensions to a complete system configuration establish that all range instrumentation requirements can be met. The receiver can be implemented in the 100 cu in volume required by all missiles and drones, and is ideally suited for transdigitizer or translator applications.
Author

N86-19307# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
DIRECT PASSIVE NAVIGATION: ANALYTICAL SOLUTION FOR PLANES Memorandum Report, Sep. 1984 - Jul. 1985
Shahriar Negahdaripour Aug. 1985 15 p
(Contract N00014-75-C-0643)
(AD-A161046; AI-M-863) Avail: NTIS HC A02/MF A01 CSCL 17/7

This paper derives a closed form sloution for recovering the motion of an observer relative to a planar surface directly from image brightness gradients. The optical flow is not computed as an intermediate step, only the spatial and temporal intensity gradients at a minimum of eight points. A linear matrix equation is solved for the elements of a 3x3 matrix. The eigenvalue decomposition of its symmetric part is then used to compute the motion parameters and the plane orientation.
GRA

N86-19308# Mitre Corp., McLean, Va.
POTENTIAL APPLICATIONS OF MULTIPLE INSTRUMENT APPROACH CONCEPTS AT 101 U.S. AIRPORTS
A. C. Silva and J. N. Barrer Sep. 1985 150 p
(Contract DTFA01-84-C-00001)
(AD-A161155; MTR-85W65; FAA-DL5-85-2) Avail: NTIS HC A07/MF A01 CSCL 01/5

Concepts for conducting multiple IFR Approaches to airports include: (1) Independent and Dependent parallel approaches at reduced runway separations. (2) Converging approaches to non-intersecting and to intersecting runways. (3) Triple arrival streams to parallel and non-parallel runways. (4) The application of these concepts to the use of separate short runways and segregated traffic streams. This report summarizes a survey of 101 U.S. Airports to determine potential applications of the above concepts. The survey identified many potential applications of each of the concepts using existing runways: (1) Parallel approaches - 25 airports; (2) Converging approaches - 74 airports; (3) Triple approaches - 6 airports; and (4) Use of separate short runways -60 airports.
GRA

N86-19309# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
VOR (VERY-HIGH-FREQUENY OMNIDIRECTIONAL RANGE) CALIBRATION SERVICES
N. T. Larsen, D. F. Vecchia, and G. R. Sugar Apr. 1985 179 p refs
(PB85-228393; NBS-TN-1069) Avail: NTIS HC A09/MF A01; SOD HC $6.50 as 003-003-02652-2 CSCL 17G

The National Bureau of Standards has designed, constructed, and evaluated a standard for the support of very-high-frequency omnidirectional range (VOR) air navigation aids. The standard consists of two instruments: (1) a digital waveform signal generator for the composite VOR audio waveform, and (2) a standard phasemeter based on time series analysis of the waveform. Experimental results, a statistical analysis of them, and the principal software listings are included.
GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-19310* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROSPACE VEHICLE Patent
L. Robert Jackson and Allan H. Taylor, inventors (to NASA) Issued 10 Dec. 1985 10 p Filed 9 Jan 1984
(NASA-Case-LAR-13155-1; US-Patent-4,557,444;
US-Patent-Appl-SN-469371; US-Patent-Class-244-172;
US-Patent-Class-244-158-R; US-Patent-Class-244-158-A) Avail: US Patent and Trademark Office

A dual structure aerospace vehicle is described which has an aeroshell structure and an internally disposed separable and reusable integral tank/thrust structure. The tank/thrust structure is insulated for cryogenic fuels and the cavity within aeroshell is insulated from the tank/thrust structure. An internal support ring within the cavity serves as an attachment for lugs on the tank/thrust structure via double hinges. The aft end of tank/thrust structure is provided with rocket engines and exit nozzles with a trunnion supporting the tank/thrust structure within the aeroshell.
Official Gazette of the U.S. Patent and Trademark Office

N86-19311*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE REMOTE SENSING OF CLOUD PROPERTIES FROM SATELLITE INFRARED SOUNDER DATA
Hwa-Young M. Yeh Feb. 1984 52 p refs
(NASA-TM-86059; NAS 1.15:86059) Avail: NTIS HC A04/MF A01 CSCL 01C

A method for remote sensing of cloud parameters by using infrared sounder data has been developed on the basis of the parameterized infrared transfer equation applicable to cloudy atmospheres. The method is utilized for the retrieval of the cloud

height, amount, and emissivity in 11 micro m region. Numerical analyses and retrieval experiments have been carried out by utilizing the synthetic sounder data for the theoretical study. The sensitivity of the numerical procedures to the measurement and instrument errors are also examined. The retrieved results are physically discussed and numerically compared with the model atmospheres. Comparisons reveal that the recovered cloud parameters agree reasonably well with the pre-assumed values. However, for cases when relatively thin clouds and/or small cloud fractional cover within a field of view are present, the recovered cloud parameters show considerable fluctuations. Experiments on the proposed algorithm are carried out utilizing High Resolution Infrared Sounder (HIRS/2) data of NOAA 6 and TIROS-N. Results of experiments show reasonably good comparisons with the surface reports and GOES satellite images. Author

N86-19312*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

GROUND VIBRATION TEST RESULTS FOR DRONES FOR AERODYNAMIC AND STRUCTURAL TESTING (DAST)/ AEROELASTIC RESEARCH WING (ARW-1R) AIRCRAFT

Timothy H. Cox and Glenn B. Gilyard Jan. 1986 36 p refs
(NASA-TM-85906; H-1261; NAS 1.15:85906) Avail: NTIS HC A03/MF A01 CSCL 01C

The drones for aerodynamic and structural testing (DAST) project was designed to control flutter actively at high subsonic speeds. Accurate knowledge of the structural model was critical for the successful design of the control system. A ground vibration test was conducted on the DAST vehicle to determine the structural model characteristics. This report presents and discusses the vibration and test equipment, the test setup and procedures, and the antisymmetric and symmetric mode shape results. The modal characteristics were subsequently used to update the structural model employed in the control law design process. Author

N86-19313*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

DYNAMICS AND CONTROLS FLIGHT TESTING OF THE X-29A AIRPLANE

Joseph Gera Jan. 1986 13 p refs Presented at the 24th AIAA Aerospace Sciences Meeting, Reno, Nev., 6-9 Jan. 1986
(NASA-TM-86803; H-1333; NAS 1.15:86803; AIAA-86-0167) Avail: NTIS HC A02/MF A01 CSCL 01C

A brief description of the flight control system of the X-29A forward-swept-wing flight demonstrator is followed by a discussion of the flight test techniques and procedures in the area of flight dynamics and control. These techniques, which evolved during the initial few months of flight testing, are based on integrating flight testing with simulation and analysis on a flight-by-flight basis. A limited amount of flight test results in dynamic stability and handling qualities is also presented. Author

N86-19314*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HOVER AND FORWARD FLIGHT ACOUSTICS AND PERFORMANCE OF A SMALL-SCALE HELICOPTER ROTOR SYSTEM

C. Kitaplioglu and P. Shinoda 13 Sep. 1985 29 p Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif., and City Univ., London, Engl.
(NASA-TM-88584; NAS 1.15:88584; AD-A160661) Avail: NTIS HC A03/MF A01 CSCL 20A

A 2.1-m diam., 1/6-scale model helicopter main rotor was tested in hover in the test section of the NASA Ames 40- by 80- Foot Wind Tunnel. Subsequently, it was tested in forward flight in the Ames 7- by 10-Foot Wind Tunnel. The primary objective of the tests was to obtain performance and noise data on a small-scale rotor at various thrust coefficients, tip Mach numbers, and, in the later case, various advance ratios, for comparisons with similar existing data on full-scale helicopter rotors. This comparison yielded a preliminary evaluation of the scaling of helicopter rotor performance and acoustic radiation in hover and in forward flight. Correlation between model-scale and full-scale performance and acoustics was quite good in hover. In forward flight, however, there were significant differences in both performance and acoustic characteristics. A secondary objective was to contribute to a data base that will permit the estimation of facility effects on acoustic testing. GRA

N86-19315# JAI Associates, Mountain View, Calif.

AERODYNAMICS OF TWO-DIMENSIONAL BLADE-VORTEX INTERACTION

G. R. Srinivasan, W. J. McCroskey, and J. D. Baeder 1985 20 p Previously announced in IAA as A85-40685
(Contract DAAG29-85-C-0002)
(AD-A160662) Avail: NTIS HC A02/MF A01 CSCL 01/3

A computational procedure and some numerical results of unsteady interaction of a helicopter rotor blade with a Lamb-like vortex of finite viscous core in subsonic and transonic flows is presented. The interaction considered here is one of the limiting cases of a more complex interaction typically encountered on helicopter rotor blade. In this limit, the interacting flow field is considered to be unsteady but two-dimensional. Accordingly, unsteady, two-dimensional, thin-layer Navier-Stokes equations are solved using a prescribed-vortex method (also called perturbation method) for the cases of stationary and moving rotor blades encountering a moving vortex passing the blades. The numerical results are compared with the recent experimental data of Caradonna et al. for the latter case. The comparison shows that for the transonic cases, the flow field is dominated by the presence of the shock waves, with strong indications of unsteady time lags in the shock-wave motions and shock-wave strengths, and of important three-dimensional effects. For subcritical-flow cases, however, the unsteady lag effects on the basic rotor blade are absent, and three-dimensional effects appear to be negligible, unlike the supercritical case. The subcritical calculations are in good agreement with the experimental data. GRA

N86-19316# Army Aviation Systems Command, St. Louis, Mo.

CORRELATION OF RESULTS OF AN OH-58A HELICOPTER COMPOSITE TAIL BOOM TEST WITH A FINITE ELEMENT MODEL

Nick Calapodas and Keith Hoff Sep. 1985 32 p
(DA Proj. 1L1-62209-AH-76)
(AD-A161062; USAAVSCOM-TR-85-D-15) Avail: NTIS HC A03/MF A01 CSCL 01/3

The results of testing an OH-58A composite tail boom and comparing its static and dynamic characteristics with those obtained from finite element analyses are presented in this report. Static load versus deflection data were used to verify the stiffness representation of the finite element model. Ground vibration test data were used to evaluate frequency and modal responses obtained from analysis. Discussions of each test configuration, including data analysis methodology and correlation results, are presented. Differences between measured static deflections and finite element analysis calculated deflections range from 6 to 12 percent. Natural frequency differences between test and analysis were less than 5 percent for the first and second elastic modes. Problems encountered during the testing and the impact on correlation are also discussed. GRA

N86-19317# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

ESTIMATION OF A Kt-VALUE BY COMPARING DIFFERENT NOTCH GEOMETRIES

J. Schijve May 1983 11 p refs
(VTH-M-469) Avail: NTIS HC A02/MF A01

The Kt-value of a small hole near a larger notch is estimated by comparing other geometries for which Kt-values are available or can be estimated with confidence. De SaintVenant's principle is employed for the comparative analysis of approximately similar geometries. The estimate gives a value accurate to within 5%. Author (ESA)

N86-19318# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

FLIGHT TEST EVALUATION OF THE NETHERLANDS FLIGHT

INSPECTION AIRCRAFT
D. Geels 14 May 1984 43 p refs Presented at 3rd International Flight Inspection Meeting, Ottawa, Ontario 28 May-1 Jun. 1984
(NLR-MP-84052-U; B8571448) Avail: NTIS HC A03/MF A01

Flight test evaluation of a flight inspection aircraft (Cessna Citation 500) equipped with position sensors, calibrated navaids receivers and a fully automatic data acquisition and data processing system for the real-time calibration and inspection of radionavigation and instrument landing systems was carried out. For the evaluation and acceptance of the en-route part of the system, a small, light-weight flexible data acquisition system was installed. Using a specially developed software package, high accuracy position reference data was computed off-line to demonstrate the CFIS navaids en route calibration performance and to determine the overall navigation accuracy of the flight inspection and navigation system during the calibration flights. The distance measuring equipment position reference method, the function and the operational principle of the flight inspection system, additional test equipment, and the data processing are described.
Author (ESA)

N86-19319# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
DETERMINATION OF LIMITATIONS FOR HELICOPTER SHIPBORNE OPERATIONS
C. F. G. M. Hofman and R. Fang 15 Aug. 1984 14 p Presented at 10th European Rotorcraft Forum, The Hague, Netherlands, 28-31 Aug. 1984 and RINA International Symposium on Air Threat at Sea, London, England, 11-14 Jun. 1985
(NLR-MP-84072-U; B8572249) Avail: NTIS HC A02/MF A01

The organization of helicopter-ship qualification trials based on experience with trials with various helicopter types on different classes of ships is discussed. Procedures applied are described and illustrated.
Author (ESA)

N86-19320# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Dept.
COMPUTATIONAL METHODS FOR THE IMPROVEMENT OF DYNAMIC ANALYTICAL MODELS OF AEROSPACE STRUCTURES
H. H. Ottens 2 Nov. 1984 37 p refs In DUTCH; ENGLISH summary
(Contract NIVR-1053)
(NLR-TR-84126-U) Avail: NTIS HC A03/MF A01

Methods to improve dynamic analytical models were surveyed. Matrix correction methods for the improvement of mass and stiffness matrices (Barman, Baruch, Chen) and parameter correction methods for the improvement of mass, damping, and stiffness submatrices (Collins, Natke) are discussed.
Author (ESA)

N86-19836# Joint Publications Research Service, Arlington, Va.
IMPROVING COMMERCIAL AIRCRAFT TRAINING SIMULATORS
V. Goryachev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 48-49 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 10 Sep. 1985 p 3 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N86-19321# New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.
HORIZONTAL DISPLAY FOR VERTICAL FLIGHT: A DIRECTION OF MOTION EXPERIMENT
Eddie J. Trujillo and Stanley N. Roscoe May 1985 48 p
(Contract N00014-81-K-0439)
(AD-A161113; BEL-85-1/ONR-85-1) Avail: NTIS HC A03/MF A01 CSCL 01/4

As a part of a research program to investigate advanced concepts for downward and forward-looking integrated displays, an experiment was conducted to determine optimum direction-of-motion relationships for a new way of presenting altitude and vertical rate information superposed on a downward-looking navigation and tactical situation display. Altitude was represented by the size of an octagon that could either dilate or constrict to indicate increasing altitude, and vertical rate was indicated by the outward or inward flow of four rate-field patterns emanating from the center of the display toward the 45, 135, 225, and 315-degree compass positions. The five factors in this experiment were altimeter and vertical rate-field direction of motion, subject ability level, aircraft vertical control order, and vertical flight course. Performance on four vertical flight profiles indicated that the out is up relationship yields superior vertical control, both in terms of control reversals and log RMS tracking precision, whereas the out is down mode results in more accurate control in the horizontal plane.
GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-19322# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL INVESTIGATION OF COMBUSTION PRESSURE OSCILLATIONS IN BYPASS CONFIGURED SOLID FUEL RAMJETS M.S. Thesis
D. C. Rigterink Sep. 1985 50 p
(AD-A160880) Avail: NTIS HC A03/MF A01 CSCL 21/2

An experimental investigation of the mechanisms involved in combustion pressure oscillations in bypass flow configured solid fuel ramjets was conducted. Testing was done using cylindrically perforated polymethylmethacrylate fuel grains in solid fuel ramjet with 180 deg opposed dumps into a plenum ahead of an axial dump combustor inlet. Bypass flow into the aft mixing chamber was accomplished using two dumps located either 180 deg or 90 deg apart, perpendicular to the centerline. Split inlet feed line lengths into the plenum were varied with no apparent change of the dominant pressure oscillation frequency of approximately 167 Hz for bypass tests. Hot wire measurements indicated that in the short-coupled axial inlet, there were no dominant vortex shedding frequencies in the separation/shear layer or at the reattachment point on the fuel grain wall. The observed pressure oscillation frequency did not appear to be related to vortex shedding from the inlet jet. Coupling of the driving disturbance from bypass flow could possibly be with a longitudinal mode of the combustor or a Helmholtz mode involving the head section plenum.
Author (GRA)

N86-19323# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Research and Testing Dept.
PERFORMANCE COMPUTATION OF TURBOFAN AND TURBOJET ENGINES IN OFF-DESIGN CONDITIONS
Georges Bridel 11 Oct. 1984 28 p refs In GERMAN; ENGLISH summary
(F+W-FO-1746) Avail: NTIS HC A03/MF A01

A prediction method of underload performance of turbojet and turbofan engines based on gas dynamic relations was developed using mass flow rate, compression ratio, turbine inlet temperature, thrust, and fuel consumption. More precise prediction results can be obtained by incorporating compressor efficiency. A BASIC computer program is described and results are compared with

existing data. Up to a throttling coefficient of 50% of the maximum thrust, the deviation with respect to the measured values falls within + or - 20%. The specific fuel consumption is improved in underload medium range but is increased at high throttling coefficients. Accuracy improvement is achieved with introduction of variable compressor and turbine efficiency. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N86-19324*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

COMPARISON OF PILOT EFFECTIVE TIME DELAY FOR COCKPIT CONTROLLERS USED ON SPACE SHUTTLE AND CONVENTIONAL AIRCRAFT

Cynthia M. Privoznik and Donald T. Berry Feb. 1986 20 p refs (NASA-TM-86030; H-1222; NAS 1.15:86030) Avail: NTIS HC A02/MF A01 CSCL 01C

A study was conducted at the Dryden Flight Research Facility of NASA Ames Research Center (Ames-Dryden) to compare pilot effective time delay for the space shuttle rotational hand controller with that for conventional stick controllers. The space shuttle controller has three degrees of freedom and nonlinear gearing. The conventional stick has two degrees of freedom and linear gearing. Two spring constants were used, allowing the conventional stick to be evaluated in both a light and a heavy configuration. Pilot effective time delay was obtained separately for pitch and roll through first-order, closed-loop, compensatory tracking tasks. The tasks were implemented through the space shuttle cockpit simulator and a critical task tester device. A total of 900 data runs were made using four test pilots and one nonpilot (engineer) for two system delays in pitch and roll modes. Results showed that the heavier conventional control stick had the lowest pilot effective time delays. The light conventional control stick had pilot effective time delays similar to those of the shuttle controller. All configurations showed an increase in pilot effective time delay with an increase in total system delay. Author

N86-19325*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FLIGHT TEST OF A RESIDENT BACKUP SOFTWARE SYSTEM

Dwain A. Deets, Wilton P. Lock, and Vincent A. Megna (Draper (Charles Stark) Lab., Cambridge, Mass.) Jan. 1986 12 p refs Submitted for publication

(NASA-TM-86807; H-1338; NAS 1.15:86807) Avail: NTIS HC A02/MF A01 CSCL 01C

A new fault-tolerant system software concept employing the primary digital computers as host for the backup software portion has been implemented and flight tested in the F-8 digital fly-by-wire airplane. The system was implemented in such a way that essentially no transients occurred in transferring from primary to backup software. This was accomplished without a significant increase in the complexity of the backup software. The primary digital system was frame synchronized, which provided several advantages in implementing the resident backup software system. Since the time of the flight tests, two other flight vehicle programs have made a commitment to incorporate resident backup software similar in nature to the system described in this paper. Author

N86-19326# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

DETERMINATION OF PERFORMANCE AND STABILITY CHARACTERISTICS FROM DYNAMIC MANEUVERS WITH A TRANSPORT AIRCRAFT USING PARAMETER IDENTIFICATION TECHNIQUES

J. H. Breeman, L. J. J. Erkelens, and A. M. H. Nieuwpoort 14 Mar. 1984 23 p refs Presented at AGARD Flight Mechanics Panel Symposium on Flight Test Technology, Lisbon, Portugal, 2-5 Apr. 1984

(Contract NIVR-1816)

(NLR-MP-84024-U; B8572246) Avail: NTIS HC A02/MF A01

A flight test program was executed with the Fokker F28 transport aircraft to investigate whether it is possible to determine performance and stability characteristics from dynamic maneuvers using parameter identification techniques, with sufficient accuracy for certification purposes. A research moving base flight simulator was used to select an optimal set of maneuvers. Flight test data was analyzed, using the two-step method which starts by reconstructing the aircraft flight path as the first step, followed by calculation of aerodynamic coefficients using regression analysis techniques. The flight test results compared with results derived from conventional test programs show that the goal is reached. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N86-19327# National Aerospace Lab., Tokyo (Japan).

NONEQUILIBRIUM EFFECTS AND PRODUCTION OF NOx IN HIGH TEMPERATURE WIND TUNNELS

Riichi Matsuzaki and Noriaki Hirabayashi 1985 26 p refs In JAPANESE; ENGLISH summary

(NAL-TR-874; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Detailed investigations of nonequilibrium properties in nozzle-flows of an arc-heated wind tunnel and a hypersonic wind tunnel at NAL are performed. In particular, the production of NOx (NO, NO2, and N2O) is estimated in the nozzle-flows. It is shown that the main constituent of NOx at the exit of the nozzles is NO. However, in the exhaust gases of the arc-heated wind tunnel, the concentration of NOx is as much as 10,000 ppm at usual conditions of operation; the concentrations of NO and NO2 are shown to be in the same order. In order to explain the production of NO2 in the exhaust gases of the arc-heated wind tunnel, oxidation of NO is estimated by taking account of the pressure recovery in a chamber, and the isothermal compression in a rotary pump of the vacuum system. The latter model, termed compression model, is shown to be able to predict the production of a high concentration of NO2. In the hypersonic wind tunnel, it is shown that the concentration of NOx in the exhaust gas is of the order of 100 ppm under usual; operating conditions, and the main constitute is inferred to be NO. Author

N86-19328# National Aerospace Lab., Tokyo (Japan).

A PRESSURE MEASURING SYSTEM USING ELECTRONICALLY SCANNED PRESSURE SENSORS (ESP) INSTALLED IN A TRANSONIC BLOWDOWN WIND TUNNEL

Toshimi Fujita, Katsuichi Murota, and Koichi Suzuki Oct. 1985 52 p refs In JAPANESE; ENGLISH summary

(NAL-TR-883; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

A pressure measuring system using electrically scanned pressure sensors (ESP) was installed in a transonic blowdown wind tunnel, and tested to see how effective an ESP system is in enhancing data productivity when compared with the scanivalve system. Results are presented of studies in which linearity, stability and repeatability characteristics of the ESP system were examined. It is shown that the deviation of the system output from linearity is less than 0.25% of the full-scale value (FS), that the thermal zero shift is of negligible magnitude, and that the repeatability is the repeatability is also quite satisfactory. The time needed for the measurements of pressures on and about an airfoil model is 8 seconds where as it has been 43 seconds with the Former scanivalue system. The data transfer time continues to be

disproportionate - 35 seconds - as long as the data processing unit is unchanged. Concurrent improvement in the data processing unit is necessary if the maximum benefit is to be obtained from the installation of an ESP system. E.A.K.

N86-19329*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPROVED MEMORY LOADING TECHNIQUES FOR THE TSRV DISPLAY SYSTEM
Wesley C. Easley, William A. Lynn, and David G. McLuer Jan. 1986 34 p refs
(NASA-TM-87649; NAS 1.15:87649) Avail: NTIS HC A03/MF A01 CSCL 14B

A recent upgrade of the TSRV research flight system at NASA Langley Research Center retained the original monochrome display system. However, the display memory loading equipment was replaced requiring design and development of new methods of performing this task. This paper describes the new techniques developed to load memory in the display system. An outdated paper tape method for loading the BOOTSTRAP control program was replaced by EPROM storage of the characters contained on the tape. Rather than move a tape past an optical reader, a counter was implemented which steps sequentially through EPROM addresses and presents the same data to the loader circuitry. A cumbersome cassette tape method for loading the applications software was replaced with a floppy disk method using a microprocessor terminal installed as part of the upgrade. The cassette memory image was transferred to disk and a specific software loader was written for the terminal which duplicates the function of the cassette loader. Author

N86-19330*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE ROLE OF A REAL-TIME FLIGHT SUPPORT FACILITY IN FLIGHT RESEARCH PROGRAMS
Archie L. Moore Jan. 1986 14 p refs Presented at the AIAA Aerospace Sciences Meeting, Reno, Nev., 6-9 Jan. 1986
(NASA-TM-86805; H-1335; AIAA-86-0166; NAS 1.15:86805) Avail: NTIS HC A02/MF A01 CSCL 14B

This paper presents some of the approaches taken by the NASA Western Aeronautical Test Range (WATR) of Ames Research Center to satisfy the ever-increasing real-time requirements of research projects such as the F-14, F-15, advanced fighter technology integration (AFTI) F-16, YAV-88, and the X-29A. The approaches include the areas of data acquisition, communications (video and audio), real-time processing and display, data communications, and tracking. Author

N86-19331# Alabama A & M Univ., Normal. Dept. of Physics.
ANALYSIS OF FLUID FLOW AT VERY HIGH REYNOLDS NUMBER AROUND SMOOTH AND ROUGH CIRCULAR CYLINDERS Final Report
S. S. R. Murty, M. C. George, and B. Shih Jul. 1985 256 p
(Contract N00014-83-K-0351)
(AD-A160351) Avail: NTIS HC A12/MF A01 CSCL 20/4

Wind tunnel tests were performed in the 12-ft pressure wind tunnel at NASA Ames Research Center during the months of May and June 1982. The model is an instrumented circular cylinder of 31.65 cm (12.46 in) diameter. Surface roughness was varied using wire mesh screens. Steady pressures, unsteady pressures, and boundary layer profiles were measured in these tests. The data pertaining to these experiments were summarized in a previous report. The collected experimental data have been analyzed during the present contract period. The task of analyzing voluminous amount of data stored on magnetic tapes by NASA was divided between Alabama A&M Univ. and Physical Research Inc. who has been a participating subcontractor. The results of the analysis of the steady pressure distributions are given in Part 1 of this document and the analysis of the boundary layer profiles and the corresponding plots are given in Part 2. GRA

N86-19332# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Research and Testing Dept.
FLOW QUALITY IN LARGE WIND TUNNELS: A SIMPLE METHOD FOR QUANTIFICATION OF MEAN FLOW INHOMOGENEITIES
Felix Hirt 12 Nov. 1984 40 p In GERMAN; ENGLISH summary
(F+W-FO-1749) Avail: NTIS HC A03/MF A01

A computational procedure for determination of jet angle and dynamic pressure influencing the wind tunnel test section flow quality and for quantification of flow inhomogeneity on a configuration causing systematic measurement errors was developed. The extent of these errors is determined with the least squares method. The procedure was applied to a modified wind tunnel model. The contribution of jet angle and dynamic pressure to measurement errors was analyzed as well as the correlation between jet angle and torpedo and sting geometry in the wind tunnel center. The procedure was applied to a wing configuration for determination of flow quality and for improvement of the measuring instrument. The procedure could be applied in industrial measurements.
Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N86-19333*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRESSURE DISTRIBUTIONS OBTAINED ON A 0.10-SCALE MODEL OF THE SPACE SHUTTLE ORBITER'S FOREBODY IN THE AEDC 16T PROPULSION WIND TUNNEL
Paul M. Siemers, III and Martin W. Henry (Analytical Mechanics Associates, Hampton, Va.) Washington Jan. 1986 442 p refs
(NASA-TM-87653; NAS 1.15:87653) Avail: NTIS HC A19/MF A01 CSCL 22A

Pressure distribution test data obtained on a 0.10-scale model of the forward fuselage of the Space Shuttle Orbiter are presented without analysis. The tests were completed in the AEDC 16T Propulsion Wind Tunnel. The 0.10-scale model was tested at angles of attack from -2 deg to 18 deg and angles of side slip from -6 to 6 deg at Mach numbers from 0.25 to 1/5 deg. The tests were conducted in support of the development of the Shuttle Entry Air Data System (SEADS). In addition to modeling the 20 SEADS orifices, the wind-tunnel model was also instrumented with orifices to match Development Flight Instrumentation (DFI) port locations that existed on the Space Shuttle Orbiter Columbia (OV-102) during the Orbiter Flight Test program. This DFI simulation has provided a means of comparisons between reentry flight pressure data and wind-tunnel and computational data. Author

N86-19334*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRESSURE DISTRIBUTIONS OBTAINED ON A 0.10-SCALE MODEL OF THE SPACE SHUTTLE ORBITER'S FOREBODY IN THE AMES UNITARY PLAN WIND TUNNEL
Paul M. Siemers, III and Martin W. Henry Jan. 1986 486 p
(NASA-TM-87654; NAS 1.15:87654) Avail: NTIS HC A21/MF A01 CSCL 22B

Pressure distribution test data obtained on a 0.10-scale model of the forward fuselage of the Space Shuttle Orbiter are presented without analysis. The tests were completed in the Ames Unitary Wind Tunnel (UPWT). The UPWT tests were conducted in two different test sections operating in the continuous mode, the 8 x 7 feet and 9 x 7 feet test sections. Each test section has its own Mach number range, 1.6 to 2.5 and 2.5 to 3.5 for the 9 x 7 feet and 8 x 7 feet test section, respectively. The test Reynolds number ranged from 1.6 to 2.5 x 10 to the 6th power ft and 0.6 to 2.0 x 10 to the 6th power ft, respectively. The tests were conducted in support of the development of the Shuttle Entry Air Data System (SEADS). In addition to modeling the 20 SEADS orifices, the wind-tunnel model was also instrumented with orifices to match Development Flight Instrumentation (DFI) port locations that existed on the Space Shuttle Columbia (OV-102) during the Orbiter Flight

test program. This DFI simulation has provided a means for comparisons between reentry flight pressure data and wind-tunnel and computational data. Author

N86-19335# Mitre Corp., Bedford, Mass.
NATIONAL SECURITY ISSUES SYMPOSIUM, 1984. SPACE, NATIONAL SECURITY, AND C3I (COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE) HELD AT BEDFORD, MASSACHUSETTS ON 25-26 OCTOBER 1984 Final Report
S. Rolph, D. Courtoy, B. Donovan, S. Gilbert, and T. Keeley May 1985 134 p Symp. held at Bedford, Mass., 25-26 Oct. 1984
(Contract F19628-84-C-0001)
(AD-A160356; MITRE-M85-3; ESD-TR-85-267) Avail: NTIS HC A07/MF A01 CSCL 22/1

The following topics were discussed at the National Security Issues Symposium held at Bedford, Mass., 25-26 Oct. 1984: The U.S. Use of Space; The U.S.S.R. Use of Space; Treaties and Legal Issues; A Defense Department Perspective; The U.S. Air Force Space Program; The U.S. Navy Space Program; The U.S. Army Space Program; An Industrial Perspective; Space Challenges; Practical Perspectives on a Space Defense Program; An Air Force Perspective; Space Defense; The Space Station; The Potential for Arms Control; Verification; The Impact of New Technologies; The Strategic Defense Initiative; and A European Perspective. GRA

N86-20183# Joint Publications Research Service, Arlington, Va.
INTERVIEW WITH COSMONAUTS KIZIM AND SOLOVYEV
G. I. Vorobyev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 63-70 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 16-22 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20184# Joint Publications Research Service, Arlington, Va.
BLAGOV ON DEVELOPMENT OF COSMONAUT EVA PROGRAMS
V. D. Blagov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 71-79 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 2-8 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20185# Joint Publications Research Service, Arlington, Va.
COMMENTS ON SOVIET-FRENCH PROJECT FOR GAMMA-1 ORBITAL TELESCOPE
G. Alimov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 80-82 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 10 Mar. 1985 p 2 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20217# Joint Publications Research Service, Arlington, Va.
INTERVIEW WITH KOVTUNENKO, VEGA PROJECT HEAD
M. Rebrov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 107-113 Transl. into ENGLISH from Krasnaya Zvedzda (Moscow, USSR), 20 Jul. 1985 p 3 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20218# Joint Publications Research Service, Arlington, Va.
RESULTS ON INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 Abstract Only
V. I. Moroz, V. M. Linkin, and D. Ertel *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 114-115 Transl. into ENGLISH from Uspekhi Fizicheskikh Nauk (Moscow, USSR), v. 146, no. 2, Jun. 1985 p 346-348 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20272# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES
In its USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 169-171 Repr. from TASS (Moscow, USSR) (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N86-19336*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ANALYTICAL INVESTIGATION OF THE DYNAMICS OF TETHERED CONSTELLATIONS IN EARTH ORBIT (PHASE 2) Quarterly Report, 22 Jun. - 21 Sep. 1985
Enrico Lorenzini, David A. Arnold, Mario D. Grossi, and Gordon E. Gullshorn Oct. 1985 36 p refs
(Contract NAS8-36606)
(NASA-CR-178607; NAS 1.26:178607; QR-2) Avail: NTIS HC A03/MF A01 CSCL 22A

The deployment maneuver of three axis vertical constellations with elastic tethers is analyzed. The deployment strategy devised previously was improved. Dampers were added to the system. Effective algorithms for damping out the fundamental vibrational modes of the system were implemented. Simulations of a complete deployment and a subsequent station keeping phase of a three mass constellation is shown. Author

N86-20188# Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR INTEGRATING EQUATIONS FOR ELEMENTS OF INTERMEDIATE SATELLITE ORBIT Abstract Only
N. V. Yemelyanov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 84-85 Transl. into ENGLISH from Astronomicheskiy Zhurnal (Moscow, USSR), v. 62, no. 3, May - Jun. 1985 p 590-597 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20195# Joint Publications Research Service, Arlington, Va.
ONE CASE OF DETERMINATION OF ELEMENTS OF INTERMEDIATE ORBIT Abstract Only
Ye. L. Lukashevich *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 90-91 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 308-310 Original language document was announced in IAA as A85-35245 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20196# Joint Publications Research Service, Arlington, Va.
ANALYTICAL EVALUATIONS OF ACCURACY IN DETERMINING AND PREDICTING PARAMETERS OF ARTIFICIAL EARTH SATELLITE MOTION USING ALTIMETER MEASUREMENT DATA Abstract Only
M. P. Nevolko and Ye. L. Mosin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 91 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 310-314 Original language document was announced in IAA as A85-35246 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20198# Joint Publications Research Service, Arlington, Va.
EVOLUTION OF ALMOST CIRCULAR ORBITS OF 12-HOUR ARTIFICIAL EARTH SATELLITES Abstract Only
M. A. Vashkovyak *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 93 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 3-15 Original language document was announced in IAA as A85-28483 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20199# Joint Publications Research Service, Arlington, Va.
COMPARISON OF CONDITIONALLY PERIODIC SOLUTIONS WITH RESULTS OF NUMERICAL INTEGRATION IN PROBLEM

OF TRANSLATIONAL-ROTATIONAL SATELLITE MOTION Abstract Only
A. A. Zlenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 93-94 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 16-25 Original language document was announced in IAA as A85-28484 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20200# Joint Publications Research Service, Arlington, Va.
OBLIQUE REGULAR SATELLITE MOTIONS AND SOME FINE EFFECTS IN MOTION OF MOON AND PHOBOS Abstract Only
Yu. V. Barkin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 94-95 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 26-36 Original language document was announced in IAA as A85-28485 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20201# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF OPTIMUM TRAJECTORIES FOR ORBITAL INSERTION FROM ANY POINT OF WHICH DESCENT INTO ATMOSPHERE IS POSSIBLE WITH STIPULATED RESTRICTIONS Abstract Only
V. A. Ilin and A. S. Filatyev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 95 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 37-48 Original language document was announced in IAA as A85-28486 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20202# Joint Publications Research Service, Arlington, Va.
APPLICATION OF RELATIVISTIC THEORY TO PROBLEMS OF SPACE VEHICLE TRAJECTORY MEASUREMENTS Abstract Only
V. S. Chaplinskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 96 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 49-62 Original language document was announced in IAA as A85-28487 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20210# Joint Publications Research Service, Arlington, Va.
NUMERICAL INVESTIGATIONS OF RESONANCE INEQUALITIES OF LOW ORBIT ARTIFICIAL EARTH SATELLITES Abstract Only
V. L. Travin and S. N. Yashkin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 102 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 53-57 Original language document was announced in IAA as A85-19996 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20211# Joint Publications Research Service, Arlington, Va.
DETERMINING SATELLITE ORBIT FROM TWO VELOCITY VECTORS Abstract Only
I. V. Onkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 102-103 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 57-61 Original language document was announced in IAA as A85-19997 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20212# Joint Publications Research Service, Arlington, Va.
USE OF DOPPLER EFFECT IN DETERMINING ANGULAR COORDINATES OF ARTIFICIAL EARTH SATELLITE Abstract Only
R. Durdyyev and A. Ibrayimov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 103 Transl. into ENGLISH from Izvestiya Akademii nauk Turkmenskoy SSR: Seriya Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk (Ashkhabad, USSR), no. 2, Mar. - Apr. 1985 p 31-35 Original language document was announced in IAA as A85-10644 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N86-19337# Los Alamos National Lab., N. Mex.
THE FORGE: A SHORT PULSE X-RAY DIAGNOSTIC DEVELOPMENT FACILITY
G. L. Stradling, T. R. Hurry, E. R. Denbow, M. M. Selph, and F. P. Ameduri 1985 6 p Presented at the SPIE 29th Annual Technical Symposium, San Diego, Calif., 19-23 Aug. 1985
(Contract W-7405-eng-36)
(DE85-017339; LA-UR-85-3002; CONF-850887-33) Avail: NTIS HC A02/MF A01

A new short pulse X-ray calibration facility has been brought on line at Los Alamos. The facility is being used for the development, testing and calibration of fast X-ray diagnostic systems. The X-ray source consists of a moderate size, subnanosecond laser focused at high intensity on an appropriate target material to generate short pulses of X-ray emission from the resulting plasma. Dynamic performance parameters of fast X-ray diagnostic instruments, such as X-ray streak cameras, can be conveniently measured using this facility. E.A.K.

N86-19706# Mullard Space Science Lab., Dorking (England).
THE UK ERS DATA CENTRE
C. G. Rapley *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 177-179 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19707# Centre National d'Etudes Spatiales, Paris (France). Earth Sciences and Applications Div.
THE CERSAT/AVISO/ALGOS: THE FRENCH PROGRAM FOR A COHERENT OCEANOGRAPHIC DATA BASE
B. Nutten *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 181-183 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

No abstracts in this category.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N86-19338# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A MODEL FOR EVALUATING COMMUNICATIONS SATELLITE INTEROPERABILITY M.S. Thesis
T. C. Gill 1985 133 p
(AD-A160750; AFIT/CI/NR-85-103T) Avail: NTIS HC A07/MF A01 CSCL 22/2

A model with which emergency communications planners can evaluate the potential interoperability of satellite systems is described. Based on minimum communications requirements set forth by the Commercial Satellite Survivability Task Force of the National Telecommunications Advisory Committee, the model addresses the technical considerations involved in system interoperability and provides the basis for further study. This paper addresses the need for finding techniques to implement an interoperable network of commercial satellites to augment our national security/emergency preparedness communications. Commercial satellite networks play an increasingly important role in providing essential communications during peacetime. They offer the means to quickly restore damaged or destroyed communications to isolated parts of the country during times of national security stress. However, the use of different technical methods by system operators presents major roadblocks to network interoperability. GRA

N86-19339# Naval Postgraduate School, Monterey, Calif.
COMPUTER SIMULATION OF DIGITAL SIGNAL MODULATION TECHNIQUES IN SATELLITE COMMUNICATIONS M.S. Thesis
C. D. Carlson Sep. 1985 292 p
(AD-A160823) Avail: NTIS HC A13/MF A01 CSCL 09/2

Tutorial on digital signal modulation techniques used in satellite communications is presented and includes computer simulation of those digital signal modulation techniques introduced. The purpose is to introduce digital signal modulation techniques and through the use of computer simulation, generate statistics which represent the characteristics of the FFT for the respective signal type. Further, an analysis of the statistics of the FFT's is conducted to determine if there is any relationship between the components of the FFT of the different signals. The statistic used to investigate this possible relationship is the F-distribution. The computer simulation is written and conducted in the FORTRAN programming language. A copy of the program, results of the simulation and the statistical analysis conducted are included in the appendices. GRA

N86-19340# Naval Postgraduate School, Monterey, Calif.
PRECISE MARINE POSITIONING USING THE GLOBAL POSITIONING SYSTEM (GPS) M.S. Thesis
Rahyono Sep. 1985 41 p
(AD-A160824) Avail: NTIS HC A03/MF A01 CSCL 17/7

The development of the Global Positioning System (GPS) has led to the possibility of positioning marine platforms with great accuracy. Position computations made from GPS observations aboard a ship and the evaluation of the accuracy and precision of a Texas Instruments TI-4100 GPS Receiver at sea in a low dynamic mode are described. The observed pseudoranges were corrected and smoothed by Doppler count, and then were used to compute position using an eight-state Kalman filter. A comparison is made between the ship's position obtained by GPS receiver and by Del Norte Trisponders. Data covering a period of 3600 s were processed and compared, yielding a total of 3171 s of data points from both positioning systems, which consisted of 2740 s of data with four satellites present and 431 s of data with three satellites. The mean of the root-mean-square differences between launch positions determined by mean of GPS satellites and by Trisponder was found to be + or - 11 m when four satellites were available and + or - 21 m when only three were present. Some 29 percent of the time, the GPS positions and Trisponders positions had similar accuracy. GRA

N86-19341# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
STUDY OF THE USE OF LIGHTWEIGHT SHIPBORNE TERMINALS FOR MARITIME SATELLITE TELECOMMUNICATIONS Final Report
J. Hagenauer (DFVLR, Oberpfaffenhofen, West Germany), M. Haerter (DFVLR, Oberpfaffenhofen, West Germany), H. Oettl (DFVLR, Oberpfaffenhofen, West Germany), D. Salzer (DFVLR, Oberpfaffenhofen, West Germany), R. Schweikert (DFVLR, Oberpfaffenhofen, West Germany), G. Bommas, B. Fritsch, W. Klages, N. Klimmek, W. Laub et al Sep. 1982 30 p refs
(Contracts ESA-4786/81-NL-MD; ESA-4701/81-NL-MD)
(ESA-CR(P)-2115) Avail: NTIS HC A03/MF A01

Smaller and less expensive satellite terminals are studied in order to cover a larger fraction of the world's commercial and yachting fleets. The problem of increased multipath propagation effects is analyzed together with system alternatives to reduce its incidence. The alternatives include antenna types, transmission power, bit rates, modulation schemes and forward correcting codes. Four light weight terminal types are described. Two operate with broad pencil beams and the others with hemispheric antennas. Multipath losses of one of the models are compensated by forward error correcting coding. Final selection requires experimental verification. Author (ESA)

N86-19342# Centre National d'Etudes Spatiales, Toulouse (France). Centre Spatial.
UTILIZATION OF DIELECTRIC RESONATORS TO IMPLEMENT HYPERFREQUENCY FILTERS FOR TELECOMMUNICATION [UTILISATION DE RESONATEURS DIELECTRIQUES POUR LA REALISATION DE FILTRES HYPERFREQUENCES DESTINES AUX SATELLITES DE TELECOMMUNICATIONS]
Michel Chaubet (Limoges Univ., France), Pierre Guillon (Limoges Univ., France), and Christian Boschet Sep. 1985 26 p refs In FRENCH; ENGLISH summary
(CNES-NT-117) Avail: NTIS HC A03/MF A01

A hyperfrequency filter with elliptical transfer function was developed for communication satellites because of weight and size advantages. Losses at 4 GHz are 0.0001. The resonator is included in a microstrip structure. The finite difference method was used to compute couplings appearing in a filter synthesis. A computer program to compute all parameters was developed. Experiments show that improvements are necessary. Author (ESA)

N86-20209# Joint Publications Research Service, Arlington, Va.
USE OF DIFFERENTIAL VERY LONG BASELINE RADIOINTERFEROMETRY IN ASTRONAVIGATION Abstract Only
L. R. Kogan, L. I. Matveyenko, and V. I. Kostenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 101 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 167-174 Original language document was announced in IAA as A85-28499 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-19343 Washington Univ., Seattle.
ROBUST CONTROL DESIGN METHODOLOGY WITH APPLICATION TO LARGE SPACE STRUCTURES Ph.D. Thesis
Warren L. Eastman 1985 199 p
Avail: Univ. Microfilms Order No. DA8521582

The development of compensators for large space structures is posed as a problem in robust control system design. A methodology is developed for the design of compensators which shape the system loop gain singular values. The frequency-shaped control and estimation theory of Gupta, as reformulated by Kim for measurement frequency-shaping, has been extended to include frequency-shaping of the control law. It is shown that zeroes of the control law shaping filter become transmission zeroes of the compensator, and this result completes the duality of the frequency-shaped regulator and estimator. To design control systems with desired loop gain characteristics, a recursive eigenstructure assignment procedure was developed. By use of this algorithm, optimal regulators and estimators with assigned eigenvalues can be designed. With a modification of the usual regulator-estimator design method, the compensator can be designed with specific eigenvalues. When frequency-shaping is incorporated into the compensator, this eigenvalue assignment feature allows the compensator to retain both the poles and the zeroes of the shaping filter. Eigenstructure assignment of the compensator specifically shapes the loop gains and can be used for robustness enhancement. This capability is demonstrated for several control systems, including one for a large space structure. Dissert. Abstr.

N86-19344*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLUIDIC MOMENTUM CONTROLLER Patent Application
Ronald S. Maynard, inventor (to NASA) Filed 24 Sep. 1985 33 p
(NASA-Case-MSC-20906-1; NAS 1.71:MSC-20906-1; US-Patent-Appl-SN-779742) Avail: NTIS HC A03/MF A01 CSCL 22B

Large angular control moments and torques are developed by controllably circulating a relatively small mass of liquid through small diameter pipes describing a large diameter loop. The loop, by thus generating and storing angular momentum, can thereby provide efficient cancellation of periodic, nonaccumulating, externally induced rotational disturbances. The loop is preferably located on or near the periphery of a structure which is to be thus stabilized. NASA

N86-19345# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EQUIVALENT CONTINUUM FINITE ELEMENT MODELLING OF PLATE-LIKE SPACE LATTICE STRUCTURES Ph.D. Thesis
S. E. Lamberson Aug. 1985 140 p
(AD-A160879; AFIT/CI/NR-85-111D) Avail: NTIS HC A07/MF A01 CSCL 22/2

A method involving finite element modelling of an equivalent continuum formulation based on matching the strain energy and kinetic energy is developed for truss type lattices with pinned joints. The method is shown to give modal results consistent with those obtained using detailed finite element modelling of the pin jointed space lattice structure, even for structures with fairly small numbers of repetitions of an identical unit cell. Feedback controllers using reduced system models derived from these modal results using Modal Cost Analysis are shown to perform as well as controllers designed using the detailed analysis results. A micropolar plate continuum model of large plate-like repetitive space lattice structures with rigid joints are derived. A plate finite element is based on this continuum model with micropolar rotations and transverse shear deformations included as nodal degrees of freedom. The natural frequencies and mode shapes are calculated using this element for a free floating hexahedral plate-like space lattice structure. These natural frequencies and mode shapes are compared to those calculated using a detailed finite element model (with every structural member modelled by a beam-column element) for several sets of frame member cross sectional properties. The static deflections of a centrally loaded and corner supported rectangular plate-like space lattice structure are also obtained and compared these two types of structural models. GRA

N86-19346# Dynamic Controls, Inc., Dayton, Ohio.
LINEAR ACTUATOR FOR LARGE SPACE STRUCTURE Final Report, Mar. 1983 - May 1984
Gavin D. Jenney and John A. Anderson 11 Sep. 1985 31 p
(Contract F33615-83-C-3601)
(AD-A161227; AFWAL-TR-85-3078) Avail: NTIS HC A03/MF A01 CSCL 22/2

The impending use of large structures in space has created a requirement controlling their alignment. Structures used for energy gathering, such as antennas or solar energy concentrators, must maintain accurate mechanical alignment in order to operate at maximum efficiency. This paper describes a linear actuation approach designed to meet the alignment requirements of space structures. The approach is based upon using a fluid pump to expand and contract two chambers enclosed by metal bellows. The general configuration is valid for a wide range of force, rate and stroke requirements required for different structure designs. GRA

N86-19347# Royal Netherlands Aircraft Factories Fokker, Amsterdam.
DEPLOYABLE RADIATOR STUDY Final Report
A. F. J. Morgownik 18 Mar. 1983 195 p refs 2 Vol.
(Contracts ESTEC-4437/80-NL-AK(SC); NIVR-2326)
(FOK-TR-R-85-0265-Vol-1; ESA-CR(P)-2109-Vol-1) Avail: NTIS HC A09/MF A01

A radiator for the space platform of the Columbus Space Station program is studied. A preliminary design of a 10 kW deployable radiator with two phase flow heat pipes feeder line is presented. A preference is found for a folding rigid panel concept, which has a lower mass for up to 20 kW. A strong preference for a parallel condenser network is shown. A flow performance analysis of the parallel feeder system gives a pressure drop of 0.1 bar, well within the specifications. The condensers are located on the heat pipe evaporators, in the middle of the heat pipes. In this way a four times higher capacity per heat pipe is obtained. The developed feeder system design requires no bends in the heat pipes. Author (ESA)

N86-19348# Royal Netherlands Aircraft Factories Fokker, Amsterdam.
SPACE STATION STUDY: THERMAL CONTROL
A. F. J. Morgownik 27 Feb. 1985 99 p refs 2 Vol.
(Contracts ESTEC-4437/80-NL-AK(SC); NIVR-2326)
(FOK-TR-R-85-019-Vol-2; ESA-CR(P)-2109-Vol-2) Avail: NTIS HC A05/MF A01

The heat rejection of the space platform of the Columbus Space Station program is analyzed in order to establish guidelines for further studies. A preliminary heat rejection capability of 125 W/sq m is determined. It is found that the integration of feeder lines in the radiator panels leads to a high reliability against meteoroid impact. Investigation of potential heat pipe layouts results in a preference for using low to moderate transport capacity heat pipes (10 to 100 Wm). A preliminary comparison of three types of coating shows that white silicate paint results in highest radiation efficiency, even when degrading is taken into account. Author (ESA)

N86-20179# Joint Publications Research Service, Arlington, Va.
FEOKISTOV REVEALS DETAILS OF SALYUT-7

REACTIVATION
K. Feokistov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 1-6 Transl. into ENGLISH from Pravda (Moscow, USSR), 5 Aug. 1985 p 3; 8 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20180# Joint Publications Research Service, Arlington, Va.
PREPARATION OF COSMONAUTS FOR SALYUT-7 REACTIVATION MISSION
Yu. Glazkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 10-13 Transl. into ENGLISH from Pravda (Moscow, USSR), Sep. 1985 p 3 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20181# Joint Publications Research Service, Arlington, Va.
SOYUZ T-13 LANDS WITH COSMONAUTS DZHANIBEKOV AND GRECHKO
In its USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 50 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 27 Sep. 1985 p 1 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20182# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON 237 DAY EXPEDITION TO SALYUT-7
S. A. Bovin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 54-62 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 9-15 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20235# Joint Publications Research Service, Arlington, Va.
CHANGE IN ANGULAR POSITION OF SPACECRAFT BY SYSTEM OF FLYWHEEL MOTORS WITH NONZERO INITIAL KINETIC MOMENT Abstract Only
K. B. Alekseyev and O. V. Zlodyreva *In its* USSR Report: Space (JPRS-USP-86-0010 13 Jan. 1986 p 129 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Mekhanika Tverdogo Tela (Moscow, USSR), no. 3, May - Jun. 1985 p 2-7 Original language document was announced in IAA as A85-44809 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20236# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF AERODYNAMIC MOMENT ON GRAVITATIONAL ORIENTATION REGIME FOR SALYUT-6, SOYUZ COMPLEX Abstract Only
V. A. Sarychev and V. V. Sazonov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 130 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 63-83 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N86-19349*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR TERRESTRIAL OBSERVATORY SPACE STATION WORKSHOP REPORT
W. T. Roberts, ed. Washington Jan. 1986 41 p refs Workshop held in Huntsville, Ala., 6 Jun. 1985
(NASA-CP-2411; M-505; NAS 1.55:2411) Avail: NTIS HC A03/MF A01 CSCL 14B

In response to a need to develop and document requirements of the Solar Terrestrial Observatory at an early time, a mini-workshop was organized and held on June 6, 1985. The participants at this workshop set as their goal the preliminary definition of the following areas: (1) instrument descriptions; (2) placement of instrumentation on the IOC Space Station; (3) servicing and repair assessment; and (4) operational scenarios. This report provides a synopsis of the results of that workshop. For individual titles, see N86-19350 through N86-19365.

N86-19350*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOFT X-RAY TELESCOPE (SXRT)
Ron Moore *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 3 Previously announced as N85-34159 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The soft X-ray telescope (SXRT) will provide direct images of the solar corona with spatial resolution of about 1 arcsecond. These images will show the global structure of the corona, the location and area of coronal holes, and the presence of even the smallest active regions and flares. The good spatial resolution will show the fine scale magnetic structure and changes in these phenomena. These observations are essential for monitoring, predicting, and understanding the solar magnetic cycle, coronal heating, solar flares, coronal mass ejections, and the solar wind. These observations complement those of the White Light Coronagraph and Ultra-Violet Coronal Spectrometer; the SXRT will detect active regions and coronal holes near the east limb, thereby giving a week or more of advanced warning for disturbed geomagnetic conditions at Earth. The instrument consists of a grazing incidence collecting mirror with a full-disk film camera at the primary focus, and a secondary relay optic that feeds a CCD camera with a field of view about the size of an average active region. Author

N86-19351*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR (SUSIM)
Ron Moore *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 4 Previously announced as N85-34160 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The solar ultraviolet spectral irradiance monitor (SUSIM) measures the ultraviolet flux from the entire Sun with high absolute accuracy over the wavelength range 120 to 400 nm with a resolution of 0.1 nm. SUSIM consists of two identical double dispersion scanning spectrometers with 5 photodiodes, 2 photon counters, and a deuterium lamp calibration source, all sealed in a canister pressurized to 1.1 atmosphere of argon. One spectrometer is used almost continuously during sunlight, the other is used once per day as a calibration check. The observations will yield improved absolute measurements of the ultraviolet solar fluxes, provide an accurate reference for studies of variability of the solar fluxes on the time scales of the solar cycle and longer, and measure shorter term changes as well. These measurements complement the ACR measurements of the total solar irradiance. The data will be used to study the physical behavior of the Sun and the Earth's atmosphere, weather, and climate. Author

N86-19352*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WHITE LIGHT CORONAGRAPH (WLC) AND ULTRA-VIOLET CORONAL SPECTROMETER (UVCS)
Ron Moore *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 5 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The WLC and UVS together reveal the corona and the roots of the solar wind from 1.5 to 6 solar radii from sun center. The WLC measures the plasma density and spatial structure of the corona and coronal mass ejections at a plasma density and spatial structure of the corona and coronal mass ejections at a resolution of about 20 arcsec. The UVCS in combination with the WLC measures the temperature and radial outflow speed of the coronal plasma. These instruments will detect mass ejections from active

regions and high speed solar wind streams from coronal holes a few days before the source regions rotate onto the face of the Sun, thus giving a week or more of advanced warning for disturbed geomagnetic conditions at Earth. Author

N86-19353*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH RESOLUTION TELESCOPE AND SPECTROGRAPH (HRTS)
Ron Moore *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 6 Previously announced as N85-34162 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The major objectives of the high resolution telescope and spectrograph (HRTS) are: (1) the investigation of the energy balance and mass balance of the temperature minimum, chromosphere, transition zone, and corona in quiet regions on the Sun as well as in plages, flares, and sunspots; (2) the investigation of the velocity field of the lower corona to study the origin of the solar wind; and (3) the investigation of preflare and flare phenomena. The HRTS instruments consists of a telescope, an ultraviolet spectrograph, an ultraviolet spectroheliograph, and an H alpha slit display system, all housed in a thermal control cannister mounted on an instrument pointing system. Author

N86-19354*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ACTIVE CAVITY RADIOMETER (ACR)
Ron Moore *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 7 Previously announced as N85-34163 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The active cavity radiometer (ACR) measures the total solar irradiance to determine the magnitude and direction of variations in the total solar radiative output. The ACR is an electrically self calibrating cavity pyroheliometer capable of measuring the total solar irradiance with an absolute accuracy better than 0.2% and capable of detecting changes in the total irradiance smaller than 0.001%. The data will be used to study the physical behavior of the Sun and the Earth's climate. Author

N86-19355*# TRW, Inc., Redondo Beach, Calif.
WAVES IN SPACE PLASMAS (WISP)
William W. L. Taylor *In* NASA. George C. Marshall Space Flight Center Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 8-9 Previously announced as N85-34164 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

Waves in space plasmas (WISP) utilizes powerful radio transmitters and sensitive receivers to probe the secrets of the magnetosphere, ionosphere and atmosphere. The scientific objective is to achieve a better understanding of the physical processes occurring in these regions. For example, audio frequency radio waves will be radiated from the long WISP antenna, will travel to the outer reaches of the magnetosphere, and will interact with Van Allen belt particles, releasing some of their energy which amplifies the waves. Study of this interaction will give a better understanding of a major magnetospheric process, wave-particle interactions. Radio waves from WISP at higher frequencies (AM radio and beyond) will be reflected by the ionosphere and will, for example, advance our understanding of bubbles in the equatorial ionosphere which affect satellite communications. Author

N86-19356*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS: SEPAC
Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 10-11 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The SEPAC instruments consist of an electron accelerator, a plasma accelerator, a neutral gas (N2) release device, particle and field diagnostic instruments, and a low light level television system. These instruments are used to accomplish multiple experiments: to study beam-particle interactions and other plasma processes; as probes to investigate magnetospheric processes; and as perturbation devices to study energy coupling mechanisms in the magnetosphere, ionosphere, and upper atmosphere. Author

N86-19357*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THEORETICAL AND EXPERIMENTAL BEAM PLASMA PHYSICS (TEBPP)
Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 12-13 Previously announced as N85-34166 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01

The theoretical and experimental beam plasma physics (TEBPP) consists of a package of five instruments to measure electric and magnetic fields, plasma density and temperature, neutral density, photometric emissions, and energetic particle spectra during firings of the particle injector (SEPAC) electron beam. The package is developed on a maneuverable boom (or RMS) and is used to measure beam characteristics and induced perturbations field (< 10 m) and mid field (> 10 m to 100 m) along the electron beam. The TEBPP package will be designed to investigate induced oscillations and induced electromagnetic mode waves, neutral and ion density and temperature effects, and beam characteristics as a function of axial distance. Author

N86-19358*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RECOVERABLE PLASMA DIAGNOSTICS PACKAGE (RPDP)
Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 14-15 Previously announced as N85-34167 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The recoverable plasma diagnostics package (RPDP) is an ejectable and recoverable satellite with flight and ground support systems so that it can be utilized in three modes: attached to an remote manipulator system; tethered; or as a subsatellite. The satellite is well instrumented with particle and field diagnostic as well as optical sensors to: investigate the dynamics of the natural environment or ejected perturbations from particle beams; measure the characteristics and propagation of electrostatic and electromagnetic waves; study wave particle interactions; and study natural properties of the magnetosphere, ionosphere, and upper atmosphere. Author

N86-19359*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTRODYNAMIC TETHER
Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 16-17 Previously announced as N83-29490 (For primary document see N86-19349 10-19)
Avail: NTIS HC A03/MF A01 CSCL 14B

The electrodynamic tether consists of a satellite deployed to a distance of 20 km by an electrically conducting tether. The space station hardware consists of a 12 meter deployment boom, satellite cradle, tether reel and motor, and other tether support systems. The electrodynamic tether will be used to perform a variety of wave experiments by exciting a wide spectrum of low frequency waves in the ionospheric plasma. The system can also be used to artificially generate and study field aligned currents and associated plasma effects. Hydromagnetic waves generated by the passage of the system through the space plasma are of particular interest in space plasma are of particular interest in space plasma research. Author

N86-19360*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
IMAGING SPECTROMETRIC OBSERVATORY (ISO)
Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 18 Previously announced as N85-34169 (For primary document see N86-19349 10-19)

Avail: NTIS HC A03/MF A01 CSCL 14B

The imaging spectrometric observatory (ISO) is discussed. The objectives of this instrument are to measure the spectral signatures of a large range of minor constituents, metastable, and excited species of both atomic and molecular ions, and neutrals in the atmosphere (from the stratosphere to the upper thermosphere). The instrument is composed of five identical spectrometers, each restricted to a given spectral range between 20 and 1200 nanometers designed for high speed operation as an imaging device. Each module is an imaging scanning spectrometer with coincident 0.5 x 0.007 degree field of view. Author

N86-19361*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING (AEPI)

Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 19 Previously announced as N85-34170 (For primary document see N86-19349 10-19)

Avail: NTIS HC A03/MF A01 CSCL 14B

The atmospheric emission photometric imaging (AEPI) consists of a dual channel, low light level video system with a filter wheel to isolate the emissions of interest, mounted on a stabilized, two axis gimbal system for pointing and control. The objectives are to produce images of various atmospheric emissions to: investigate ionospheric transport processes; observe induced emissions from artificial particle injection; measure electron impact cross sections of atmospheric species; study natural aurora at high spatial and temporal resolutions and in the ultraviolet. Author

N86-19362*# Southwest Research Inst., San Antonio, Tex.

MAGNETOSPHERIC MULTIPROBES (MMP/CHEMSAT)

Jim Burch *In* NASA. George C. Marshall Space Flight Center Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 20-21 Previously announced as N85-34171 (For primary document see N86-19349 10-19)

Avail: NTIS HC A03/MF A01 CSCL 14B

The magnetospheric multiprobes (MMP) are a set of ejectable, self contained, limited lifetime free flyers which are designed to make plasma diagnostic measurements at multiple locations within telemetry range of the space station's coorbiting platform and polar platform. When configured as CHEMSATs, one or more MMP's will conduct chemical releases as tracers or modifiers of the local plasma and field environment, while diagnostic measurements are made from other MMP's and from the nearby platform. The probes will be battery powered and will have lifetimes of a few days to several weeks. Up to 12 probes would be placed on the coorbiting platform and the polar platform every six months and two years respectively for use in the campaign mode of operation. Author

N86-19363*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

WIDE ANGLE MICHELSON DOPPLER IMAGING INTERFEROMETER (WAMDII)

Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 22-23 Previously announced as N85-34172 (For primary document see N86-19349 10-19)

Avail: NTIS HC A03/MF A01 CSCL 14B

The wide angle Michelson Doppler imaging interferometer (WAMDII) is a specialized type of optical Michelson interferometer working at sufficiently long path difference to measure Doppler shifts and to infer Doppler line widths of naturally occurring upper atmospheric Gaussian line emissions. The instrument is intended to measure vertical profiles of atmospheric winds and temperatures within the altitude range of 85 km to 300 km. The WAMDII consists of a Michelson interferometer followed by a camera lens and an 85 x 106 charge coupled device photodiode array. Narrow band filters in a filter wheel are used to isolate individual line emissions and the lens forms an image of the emitting region on the charge coupled device array. Author

N86-19364*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

VEHICLE CHARGING AND POTENTIAL (VCAP)

Bill Roberts *In its* Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 24-25 Previously announced as N85-34173 (For primary document see N86-19349 10-19)

Avail: NTIS HC A03/MF A01 CSCL 14B

The vehicle charging and potential (VCAP) payload includes a small electron accelerator capable of operating in a pulsed mode with firing pulses ranging from 600 nanoseconds to 107 seconds (100 milliamps at 1000 volts), a spherical retarding potential analyzer - Langmuir probe, and charge current probes. This instrumentation will support studies of beam plasma interactions and the electrical charging of the spacecraft. Active experiments may also be performed to investigate the fundamental processes of artificial aurora and ionospheric perturbations. In addition, by firing the beam up the geomagnetic field lines of force (away from the Earth) investigations of parallel electric field may be performed. Author

N86-19365*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INITIAL PLACEMENT OF STO INSTRUMENTS

In its Solar Terrestrial Observatory Space Station Workshop Report Jan. 1986 p 26-37 refs Previously announced as N85-34174 (For primary document see N86-19349 10-19)

Avail: NTIS HC A03/MF A01 CSCL 14B

The current plans for the placement of the Solar Terrestrial Observatory (STO) space station will make use of each of the currently planned space station elements - the manned space station, the polar platform, and the coorbiting platform. A designation of the instrument placement on each element along with a summary of the mass, volume, power and data requirements which these instrument will impose is provided in tabular form. R.J.F.

N86-19366# Battelle Inst., Frankfurt am Main (West Germany).

ORBITING LIDARS FOR ATMOSPHERIC SOUNDING Final Report

M. Endemann, H. Grassl (Kiel Univ., West Germany), P. Schluessel (Freie Univ.), K. Labitzke (Technische Univ., Munich), H. Quenzel (Technische Univ., Munich), E. Thomalla (Technische Univ., Munich), and K. Nodop Dec. 1984 279 p refs 2 Vol.

(Contract ESTEC-5186/82-NL-HP)

(BLeV-R-65.498-5-Vol-1; ESA-CR(P)-2112-Vol-1) Avail: NTIS HC A13/MF A01

The conceptual design of a spaceborne lidar instrument is refined, its performance is simulated, and the measurement utility for weather forecasting is assessed. The instrument features a modular design and can be developed in consecutive stages. The input of the improved initial data on the accuracy of weather forecasting is discussed. It is shown that an improvement in long term weather forecasts can be expected. Simulations of the backscatter lidar as well as of the more advanced humidity, temperature and pressure profiles are detailed. Backscatter measurement accuracy is adequate for the relevant situations, but the profiling applications are difficult to realize from the envisaged orbit height of 800 km. A lower orbit near 250 km is required to achieve the desired horizontal resolution. Author (ESA)

N86-19367# Battelle Inst., Frankfurt am Main (West Germany).

ORBITING LIDARS FOR ATMOSPHERIC SOUNDING. VOLUME 2: REALIZATION OF LABORATORY LASER CONFIGURATIONS Final Report

M. Endemann, E. Hansen, and H. Hoeffgen Apr. 1985 80 p refs 2 Vol.

(Contract ESTEC-5186/82-NL-HP)

(BLeV-R-65.498-6-Vol-2; ESA-CR(P)-2112-Vol-2) Avail: NTIS HC A05/MF A01

Investigations concerning the design of a solid state transmitter laser for a spaceborne lidar are presented. Wavelength is to be 700 to 800 nm. Tunability is advantageous. Q-switching operation is discussed. The properties of Alexandrite, an experimental crystal material, are described. Thermal pumping is the reason for improved performance at high temperature. Initial tests with the laboratory laser show shortcomings, including the optical quality

of the Alexandrite laser rod, the fact that the used pump cavity was not optimized and the operating conditions of the noble gas flash lamps which make it necessary to explore lamps life for those conditions. The presented simulation computer program is considered as the first step to a refined program that can be used in the performance prediction of solid state lasers.
Author (ESA)

N86-19368# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
GOES X-RAY SENSOR INFLIGHT RELATIVE CALIBRATION
H. A. Garcia Mar. 1985 28 p
(PB85-221091; NOAA-TM-ERL-SEL-72) Avail: NTIS HC A03/MF A01 CSCL 14B

Whole disk, continuum X-ray measurements in two bandwidths 1/2 - 4A and 1 - 8A are simultaneously observed by two GOES satellites, spatially separated in longitude by about 60 degrees. Ideally solar X-rays should register the same measurement at both satellites but because of instrumental peculiarities and different ambient particle environments the actual measurements recorded are slightly different. A computer program processes one minute averaged measurements obtained from GOES archive data tapes to formulate the linear transformation parameters that relate the X-ray measurements of the primary satellite to those of the secondary satellite. A set of two parameters consisting of a constant offset and proportionality factor is determined for each of the four dynamic ranges for which data is available. Measurements are processed singly and sequentially by means of a Kalman filter to obtain continuously updated values for the unknown model parameters. GRA

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-19369 Auburn Univ., Ala.
ACCELERATION EFFECTS IN SOLID PROPELLANT ROCKET MOTORS Ph.D. Thesis
Mark Thomas Langhenry 1985 66 p
Avail: Univ. Microfilms Order No. DA8518408

The performance variations due to acceleration loads imposed on spinning solid propellant rocket motors are investigated. The four potentially most significant modes of acceleration-induced phenomena are identified from a study of the literature and modeled. The four modes are a mechanical mode which deal with deformations of the propellant and case; a thermodynamic mode which covers acceleration induced combustion phenomena; a stress mode which covers the stressed propellant effect on burn rate; and a gay dynamic mode which deals with changes in gas flow in the chamber and through the nozzle. Simplified models of each mode are developed or taken from the literature and are added to an internal ballistics evaluation computer program. The resulting analysis is the first to include all of the modes. In order to do this an original analysis of the mechanical and stress modes was necessary. However, the analysis shows that the stress mode is not important for the circular perforated grains studied. The other effects are shown to have significant influence on solid rocket motor performance. The magnitude of the different mode effects are such that one may not be ignored over the others as has been done in the past. The results of the analysis are compared to published rocket motor data. The comparisons indicate an erosive burning effect that is a function of spin rate. A quantitative explanation of the erosive effect is presented. Author

N86-19370 Alabama Univ., Huntsville.
UNSTEADY FLAME ZONE COMBUSTION RESPONSE OF SOLID PROPELLANT ROCKET MOTORS Ph.D. Thesis
Pil-Kyu Kim 1985 229 p
Avail: Univ. Microfilms Order No. DA8519062

The main purpose of the present study is, therefore, to investigate the role of radiative heat transfer upon combustion instability as determined from response function calculations. The formulation is based on the Arrhenius law with a single step forward chemical reaction, idealized two-dimensional mean flow, and impressed arbitrary acoustic wave incidences. Premixed, laminar flame, multi-dimensional radiative heat transfer in participating media will be considered in this study. The response function calculations are ideally carried out using finite elements. Analytical boundary conditions at the flame edge and decomposition zones are implemented via the Lagrange multipliers in finite elements. To this end, the multi-dimensional, nonlinear, time-dependent, simultaneous equations are expanded with the relevant boundary conditions into first and second order perturbations. All excited frequencies are calculated by means of eigenvalue analyses and the combustion response functions corresponding to these frequencies are determined. Dissert. Abstr.

N86-19371# National Aerospace Lab., Tokyo (Japan).
START TRANSINET ANALYSIS OF TURBOPUMP-FED LOX/LH2 ROCKET ENGINE (LE-5)
Akio Kanmuri, Yoshio Wakamatsu, Takashi Shimura, Kyoichiro Toki, and Yoshihiro Torii 1985 35 p refs In JAPANESE; ENGLISH summary
(NAL-TR-868; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The first Japanese LOX/LH2 rocket engine (LE-5) employs a turbopump-fed gas generator cycle system. The LE-5 engine starts up in such an unique method that the power of the turbopump system is at first built up by a coolant bleed cycle followed by a gas generator cycle. A computer program for the start transient simulation has been developed and it has been utilized for analysing start-up characteristics of the LE-5 engine. The outline of the computer program and the analytical results are discussed here. The results of the analysis have been effectively used for the setting of the firing test condition and for the termination of the engine start sequence in each phases of the development. The results of the simulation are also compared with the experimental results. Author

N86-19372# Space and Missile Test Center, Patrick AFB, Fla.
DIFFUSION MODELING IN SUPPORT OF THE SPACE SHUTTLE Final Report, 1984 - 1985
Billie F. Boyd and Clinton R. Bowman, Jr. 14 Oct. 1985 16 p
(AD-A160963; ESMC-TR-85-04) Avail: NTIS HC A02/MF A01 CSCL 21/2

The requirements for a computer model to forecast the diffusion of rocket exhaust during launches of the Space Shuttle are discussed.The REEDM computer code includes basic mathematical expressions for atmospheric dispersion models, cloud-rise models and models for calculating the gravitational deposition of acid drops. Inputs are vehicle and other source parameters, meteorological parameters defining the state of the planetary boundary layer (including turbulence parameters) and physical properties of the rocket exhaust cloud. During launches of the Space Shuttle, the rocket engines emit large quantities of exhaust products, which combine with water from the sound suppression system and result in the formation of a large hot acid cloud near ground level. The cloud grows rapidly through entrainment and, shortly after ignition, it lifts off the ground and rises to its stabilization height. Typically the top of the stabilized cloud produced by the Space Shuttle is more than 2 kilometers above ground level. By convention, this cloud is referred to as the ground cloud. The rocket engines of the ascending vehicle also leave an exhaust trail which extends through the troposphere and beyond. The REEDM computer program is designed to calculate peak concentration, dosage and surface deposition (resulting from both gravitational settling and precipitation scavenging) of ground cloud constituents downwind from normal launches and launch failures. GRA

N86-19373# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON PARAMETERS OF A SUPERSONIC COMBUSTION CHAMBER WITH ORGANIZATION OF COMBUSTION AT THE FLAME FRONT
E. L. Solokhin, V. A. Mironenko, and V. I. Ivanov 25 Oct. 1985 18 p Transl. into ENGLISH from Trudy, Ufimskiy Aviatsionnyy Institut, Voprosy Teorii i Rascheta Rabochikh Protsessov Aviatsionnykh Dvigately (USSR), no. 30, 1972 p 60-70
(AD-A161176; FTD-ID(RS)T-0900-84) Avail: NTIS HC A02/MF A01 CSCL 21/2

In some engineering problems, it is necessary to burn fuel in the combustion chamber with supersonic flow. As a rule, the scheme of organization of the process in such a chamber presupposes a separate accompanying feed of fuel and oxidant in which combustion of fuel takes place in a diffusion flame front. In this article we give theoretical results of the investigation of a supersonic combustion chamber in which combustion of the fuel mixture takes place in a oblique flame front stabilized by an external source (analogous to the subsonic combustion chambers of ramjets). The possibility of the existence of such an oblique flame front in a supersonic flow of fuel mixture was previously proved experimentally. GRA

N86-19374# Los Alamos National Lab., N. Mex.
ANTI-MATTER PROPULSION: FEASIBILITY, STATUS AND POSSIBLE ENHANCEMENT
Steven D. Howe 1985 13 p Presented at the Manned Mars Mission Workshop, Huntsville, Ala., 10-14 Jun. 1985 Submitted for publication
(Contract W-7405-eng-36)
(DE85-015716; LA-UR-85-2443; CONF-8506149-3) Avail: NTIS HC A02/MF A01

Anti-protons are currently being produced in the world in amounts of about 10 to the 14th power particles per year. With sufficient effort, almost a mg/yr (6 x 10 to the 20th power) could be produced by the early 2000s. Current experiments plan to decelerate and capture about 10 to the 10th power or greater antiprotons in a electrostatic Penning trap. Such traps may provide a source of low energy antiprotons for development of better storage mechanisms suitable for propulsion. Proposals were investigated which would amplify the average energy released per antiprotons used. The proposals entail using the antiprotons to produce inertial confinement fusion of a capsule or to produce negative muons which can catalyze fusion. By increasing the energy released per antiprotons, the effective specific costs, $/joule, can be reduced to attractive levels. These two proposals and other areas of research can be investigated now and will help in assessing the feasibility of a antiprotons engine. Author

N86-19375# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
COMBUSTION OF FOUR COMPOSITE PROPELLANTS AT SUBATMOSPHERIC PRESSURES
H. F. R. Schoyer and P. A. O. G. Korting Aug. 1983 72 p refs Prepared in cooperation with Prins Maurits Lab. TNO, Rijswijk, Netherlands
(VTH-LR-399; PML-1983-135) Avail: NTIS HC A04/MF A01

The combustion behavior of 4 composite propellants was investigated in the pressure region between 20 and 140 kPa and at temperature of -40, 25 and 50 C. The experimental technique is based upon a cigarette burning rocket motor connected to a vacuum system. All four propellants display a De Vieille burning rate law. The burning rate is strongly affected by composition, pressure, and temperature. Combustion instability predominantly occurs at pressures below 50 kPa. Frequency spectra, pressure amplitudes versus mean pressure, and frequency versus mean pressure were determined for all 12 cases. The propellant response function was estimated. From all propellants, ICT 201 seems to be the least susceptible to oscillatory combustion. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N86-19376* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MALEIMIDO SUBSTITUTED AROMATIC CYCLOTRIPHOSPHAZENES Patent
Devendra Kumar, George M. Fohlen, and John A. Parker, inventors (to NASA) Issued 29 Oct. 1985 22 p Filed 11 Apr. 1984
(NASA-Case-ARC-11428-1; US-Patent-4,550,177;
US-Patent-Appl-SN-499126; US-Patent-Class-548-413;
US-Patent-Class-260-927-N; US-Patent-Class-564-113;
US-Patent-Class-428-410; US-Patent-Class-528-310) Avail: US Patent and Trademark Office CSCL 07C

4-Aminophenoxy cyclotriphosphazenes are reacted with maleic anhydride to produce maleamic acids which are converted to the maleimides. The maleimides are polymerized. By selection of starting materials (e.g., hexakis amino or trisaminophenoxy-trisphenoxy-cyclo-triphosphazenes), selection of molar proportions of reactants, use of mixtures of anhydrides and use of dianhydrides as bridging groups a variety of maleimides and polymers are produced. The polymers have high limiting oxygen indices, high char yields and other useful heat and fire resistant properties making them useful as, for example, impregnants of fabrics. NASA

N86-19377# Kentucky Univ., Lexington.
MODELING OF EQUILIBRIUM GAS ADSORPTION FOR MULTICOMPONENT VAPOR MIXTURES Contractor Report, Aug. 1983 - Aug. 1984
P. J. Reucroft, K. B. Patel, W. C. F. Russell, and R. Sekhar Aug. 1985 40 p
(Contract DAAK11-82-K-0016)
(AD-A159632; CRDC-CR-85040) Avail: NTIS HC A03/MF A01 CSCL 07/4

Adsorption data has been obtained for CHCl3/CCl4 binary vapor mixtures on BPL-activated carbons and interpreted in terms of the Dubinin-Polanyi equation. The kinetics of adsorption for CHCl3/CCl4, n-hexane/benzene and CH2Cl2/CHCl3 binary vapor mixtures have been determined on BPL-activated carbon and interpreted in terms of the Wheeler equation. Author (GRA)

N86-19378# Chicago Univ., Ill. Dept. of Chemistry.
ENERGETIC MATERIALS FROM CUBANE Interim Report, 1 Aug. 1984 - 31 Jul. 1985
Philip E. Eaton Sep. 1985 23 p
(Contract N00014-84-K-0645)
(AD-A160966) Avail: NTIS HC A02/MF A01 CSCL 07/3

Cubanes are exceptionally strained compounds with high heats of formation. They are also very dense. The combination of these two properties along with proper substituents on the cubane nucleus should lead to highly energetic materials useful as explosives and propellant additives. Cubane-1,4-dicarboxylic acid can be fairly easily prepared from readily available starting materials; however, the methodology for the preparation of more highly substituted cubanes--those necessary for the proposed use--has not yet been developed. It is the purpose of this project to develop and investigate approaches to such highly substituted cubanes. This progress report describes work accomplished during the first year of the contract. Before starting on the present contract, we had discovered that it was possible to use amide groups on the cubane nucleus to activate adjacent positions for lithiation. Further, we had shown that such ortho-lithiated cubanes could be intercepted with mercury salts to produce cubyl mercurials. The carbon-mercury bond in such compounds was shown to be reactive toward iodine; the final result being the production of cubyl iodides. Thus, as shown in the overall scheme (illustrated overleaf), we succeeded in preparing and characterizing 2,7-diiodo-1,4-bis(N,N-diisopropylcarboxamido)cubane, the first tetrasubstituted cubane. GRA

N86-19379# Brookhaven National Lab., Upton, N. Y.
STUDIES INVOLVING THE REDUCTION OF SOD-Cu(2+) BY CO2(-) RADICALS
D. E. Cabelli and H. J. Bielski 1985 6 p refs Presented at the 4th International Conference on Superoxide and Superoxide Dismutase, Rome, Italy, 1 Sep. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001204; BNL-36894; CONF-8509146-2) Avail: NTIS HC A02/MF A01

Pulse radiolysis and other radiolytic techniques have proven very potent tools in the elucidation of the mechanism of O2(-) dismutation by superoxide dismutases (SOD). Some recent work in this laboratory involved a systematic study of the reduction of SOD-Cu(2+) (bovine liver) by CO2(-) radicals and the kinetics of the interaction between the resultant SOD-Cu(+) and peroxide, a process that is known to inactivate the enzyme and thought to generate a bound OH radical. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N86-19380* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TOUGHENING REINFORCED EPOXY COMPOSITES WITH BROMINATED POLYMERIC ADDITIVES Patent
Zohar Nir (National Academy of Sciences/National Research Council, Washington, D.C.) and William J. Gilwee, Jr., inventors (to NASA) Issued 29 Oct. 1985 12 p Filed 12 May 1983 Sponsored by NASA
(NASA-Case-ARC-11427-1; US-Patent-4,550,129;
US-Patent-Appl-SN-493865; US-Patent-Class-523-433;
US-Patent-Class-523-445; US-Patent-Class-523-66468;
US-Patent-Class-525-527; US-Patent-Class-525-423;
US-Patent-Class-528-102; US-Patent-Class-528-103) Avail: US Patent and Trademark Office CSCL 11D

Cured polyfunctional epoxy resins including tris(hydroxyphenyl) methane triglycidyl ether are toughened by addition of polybrominated polymeric additives having an EE below 1500 to the pre-cure composition. Carboxy terminated butadiene acrylonitrile rubber is optionally present in the precure mixture as such or as a pre-formed copolymer with other reactants. Reinforced composites, particularly carbon reinforced composites, of these resins are disclosed and shown to have improved toughness. NASA

N86-19381 Cornell Univ., Ithaca, N.Y.
INELASTIC DEFORMATION AND MICROSTRUCTURAL ANALYSIS OF TRANSITION METAL CARBIDES Ph.D. Thesis
Vivek Madan Sura 1985 210 p
Avail: Univ. Microfilms Order No. DA8516936

The densification behavior of (Ti, V)C alloys was studied by hot-pressing experiments. The effects of temperature and composition on final porosity, grain size and phases present were determined. The diffusion coefficients determined from densification data agree well with the grain boundary diffusion coefficient of carbon. This observation, combined with microstructural evidence, indicates that the final stage of densification is controlled by rain boundary diffusion of carbon and/or metal. The enhanced densification and grain growth in VC rich samples are attributed to the presence of second phase material along the grain boundaries. The rapid interdiffusion of Ti and V in (Ti, V)C to form a single phase, raises the possibility of faster diffusion along the migrating boundaries in contrast to the stationary boundaries. Dissert. Abstr.

N86-19382 Purdue Univ., West Lafayette, Ind.
SYNTHESIS AND ELECTRICAL CHARACTERIZATION OF DOPED BETA-ALUMINA COMPOUNDS Ph.D. Thesis
Danny Ray White 1985 314 p
Avail: Univ. Microfilms Order No. DA8520089

A series of first row transition metal doped beta and stabilized beta double prime alumina compounds were prepared to study the role of the dopant ion on the structure and stability of the beta-aluminas, as well as its effect on the resultant materials ionic conductivity. The majority of these compounds were synthesized by a skull melting technique, in which crystals are grown by slow cooling the melt from -2000 C. It was found that only cobalt, nickel, and zinc formed doped beta-alumina compounds. However, the resultant boules of these materials were a heterogeneous mixture of both the doped beta and stabilized beta phases. Characterization of these compounds with respect to their composition, structure, and distribution of the dopant ions was also performed. Electrical characterization, in the form of ionic conductivity measurements, were made via A.C. bridge/complex plane analysis, and phase synchronous detection/computer modeling methods. Dissert. Abstr.

N86-19383# National Aeronautical Lab., Bangalore (India). Structures Div.
DIFFUSION STUDIES ON ADVANCED FIBRE HYBRID COMPOSITES
R. Gopalan and M. V. V. Murthy Apr. 1985 23 p refs
(NAL-TM-ST-8508) Avail: NTIS HC A02/MF A01

The moisture diffusion characteristics of simple (E-glass, Graphite and Kevlar) and hybrid (E-Glass-Graphite, Graphite-Kevlar and Kevlar-E-Glass) unidirectional composites have been studied at 296 K and 343 K under water immersion conditions. The equilibrium moisture content (Mm) and diffusion coefficient (Dx) of Kevlar fiber composite are respectively as high as 5 and 10 times that of E-glass/Graphite fiber composites. It is shown that it is possible to evaluate the diffusion characteristics Mm and Dx of hybrid composites from the corresponding values of their simple composites. The experimental data for simple and hybrid composites comprising both impermeable and/or permeable fiber composites show good correlations with the analytical Fickian Diffusion plot. The effect of edge coating on the moisture absorption is quite significant in the permeable fiber composites. E.A.K.

N86-19384# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
MECHANICAL PROPERTIES AND DAMAGE MECHANISMS OF CARBON FIBER-REINFORCED COMPOSITES. TENSION LOADING
Jun. 1985 415 p refs
(DFVLR-FB-85-45; ISSN-0171-1342) Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

The fracture properties and the damage mechanisms of unnotched and notched graphite/epoxy laminates were investigated. The response of unidirectional and multidirectional stacking sequences under increasing static tension loading, constant amplitude cyclic tension and thermal fatigue loading, and the relationships between damage state and residual stiffness and strength at four different environmental conditions were examined. Global laminate properties were compared with macro and microscopic modes of failure. For individual titles, see N86-19385 through N86-19399.

N86-19385# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
TEST FACILITIES **c39**
R. Prinz and K. Schmidt *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 17-32 (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Facilities for static, cyclic thermal, and cyclic mechanical load tests on 1800 flat carbon fiber reinforced composite specimens are described. Environment simulation facilities are outlined. • Author (ESA)

N86-19386# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
TEST SPECIMENS
M. Gaedke *In its* Mechanical Properties and Damage Mechanisms

of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 33-40 (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Quality control on prepregs used in a test program of carbon fiber reinforced laminates extending over several years is described. Manufacturing parameters, and recording of information on stacking, dimensions, etc., are outlined. Author (ESA)

N86-19387# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
NONDESTRUCTIVE EVALUATION
J. Block and R. Schuetze *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 41-54 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Radiographic, ultrasonic, acoustic emission, and grating reflection techniques used for nondestructive evaluation of carbon fiber reinforced composites are described. Combined radiographic and ultrasonic techniques can cover most of the interesting aspects of damage propagation by yielding well-focused photographs and scans. Acoustic emission analysis is particularly suited for the resolution of the damage progression process with respect to time and time-dependent parameters. The grating reflection technique yields photographs showing the surface deformations of the specimens. Author (ESA)

N86-19388# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
ANALYSIS TOOLS
L. vonBonin and H. Eggers *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 55-67 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

The statistical data treatment and computer programs used in handling large numbers of test results and assessment of stress distributions leading to damage propagation of fracture of carbon fiber reinforced laminates are described. To overcome computing costs with standard finite element programs, the LAMINA program was initiated. Its basic component is a triangular hybrid plate element with degrees of freedom for bending and membrane action as well as for normal and shearing stresses on its upper and lower surfaces. A special condensation scheme produces multilayer plate elements and substructures so that arbitrarily stacked laminates can be modelled in great detail with a relatively small number of degrees of freedom. Failure progression criteria are appended to the system of simultaneous equations such that damage propagation tracking does not require repeated triangulation of the global stiffness matrix. Author (ESA)

N86-19389# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RESPONSE OF STATICALLY TESTED UN-NOTCHED SPECIMENS
M. Gaedke *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 69-124 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Properties of unidirectional plies for three fiber-matrix systems of carbon fiber reinforced epoxies were studied to form the basis for the analytical prediction of the response of multidirectional laminates. The predictions include the elastic moduli, first ply failure, and tensile strength of the laminates, and take into account the state of prestress induced by temperature and moisture. Additional tests were performed with multidirectional laminates to validate the analytical predictions and to support the failure analysis. Author (ESA)

N86-19390# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RESPONSE OF STATICALLY TESTED NOTCHED SPECIMENS
H. Eggers and L. Kirschke *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 125-190 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

The significance of notches in carbon fiber-reinforced epoxy resins was assessed in quasi-static tension tests with unidirectional on-axis and off-axis specimens as well as multidirectional specimens containing either a single central notch or two symmetrical notches at the edges. Numerical calculations were performed to establish failure criteria for incorporation into the computer program LAMINA. Using the finite element programs ASKA and LAMINA, the states of stress at the crack tips in unidirectional laminates were analyzed for different crack lengths at load intensities under which crack extension was observed. The critical stress intensity factors (K1 and 2) were established. The strain energy release rate concept is found to be the most promising. Using this approach it is possible to identify the total energy release rate as well as its separation into components, associated with the two crack opening modes, from which K1 and 2 are obtained. Author (ESA)

N86-19391# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RESPONSE OF MECHANICALLY FATIGUED UN-NOTCHED SPECIMENS
H. C. Goetting *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 191-215 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Tensile fatigue tests of unidirectional, angle-ply and multidirectional laminates were performed under four different environmental conditions to investigate the influence of temperature and moisture on the fatigue strength and on the damage mechanisms of unnotched carbon fiber-reinforced laminates. Results show that the fatigue properties of matrix-controlled laminates are sensitive to temperature and moisture, whereas the more fiber-controlled laminates show no significant degradative effects. However, the fatigue performance of carbon fiber-reinforced laminates under worst-case environments clearly exceeds that of metallic materials even in the presence of large data scatter. Author (ESA)

N86-19392# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RESPONSE OF MECHANICALLY FATIGUED NOTCHED SPECIMENS
L. Kirschke and G. Kress *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 217-238 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

The residual strength and stiffness of notched laminates under cyclic loading were studied. Damage progression in on-axis unidirectional test specimens with two symmetrical edge notches under increasing numbers of load cycles with $R = 0.1$ was determined. Tests with multidirectional laminates containing unloaded circular holes at the center of the test section were examined. Matrix cracks and delaminations in and between adjacent plies of the laminates were observed. Strength and stiffness measurements after prescribed numbers of load cycles with $R = 0.1$ show that the global stiffness of the test specimens diminishes whereas the residual static strength increases until shortly before failure. The strength increase is attributed to the relief of local stress due to the crack formation and progression in the plies of the laminate around the hole. Author (ESA)

N86-19393# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RESPONSE OF THERMALLY FATIGUED UN-NOTCHED SPECIMENS
W. Hartung *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 239-260 refs (For primary document see N86-19384

10-24)
Avail: NTIS HC A18/MF A01

In order to assess the effects of thermal cycling in a typical space environment on the mechanical properties of carbon fiber reinforced composites, and to study the potential mechanisms of damage, a test program was performed with + or - 45 deg, 2 s laminates prepared from five different fiber-resin systems. Test specimens were evaluated prior to and after exposure to various numbers of thermal cycles, in vacuum, between +100C and -160C. Test results show that strength degradations of up to 20% occur in epoxy-based laminates, and much more in the polyimide-based laminates, accompanied by corresponding stiffness degradations. Both types of degradation are traced to matrix cracking and to interface deterioration. Author (ESA)

N86-19394# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
STRAIN CAPABILITIES AND STRAIN RATE EFFECTS IN EPOXY RESINS AND LAMINATES
J. Block and H. Twardy *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 261-296 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Ranges of strain capability required to exploit the potential of carbon fibers in laminates were investigated using unidirectional rings with a variety of matrix formulations and fiber types under ambient conditions. By increasing the matrix failure strain from 1.5% to 2.5%, strength improvements between 14% and 54% are possible. The sensitivity of the strength and stiffness properties of the test specimens to different strain rates was studied. The tests show that for strain rates > 1.0% per sec, the strength values of the test specimens remain constant regardless of the ductility of the matrix. The majority of the tests were accompanied by acoustic emission analyses. Assuming that the acoustic energy release is an indicator for the fracture phenomenon as such, ideal or less ideal fracture sequences can be identified by comparison of the integrated energy release at prescribed deformation states. Author (ESA)

N86-19395# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RADIATIVE AND OXIDATIVE EFFECTS
G. Niederstadt *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 297-304 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Deterioration of carbon fiber reinforced epoxy resins was studied. Simulation of electron beam irradiation as experienced during the service life of a spacecraft structure in a typical geostationary orbit shows that neither the tensile strength nor the elongation to failure of 1 mm thick laminates are impaired after 300 million rads. A slight reddish tint on the laminate surfaces may indicate optical property changes. The long-time exposure of test specimens to open atmospheric conditions in 75 m and 1600 m elevation reveals matrix cracks and deteriorations of the laminate surfaces, due to UV-B type irradiation, and the presence of moisture and oxygen. Tensile strength diminishes to 90% of the initial strength after an irradiation dose equivalent to three calendar years. An oxidative effect is observed on specimens subjected to a sustained temperature of 120C in the presence of air. The measured weight loss of 914C/T300-laminates is 3.3% after 28,900 hr. At 100C, the rate of weight loss is considerably less. Author (ESA)

N86-19396# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
FRACTOGRAPHICAL INVESTIGATIONS
P. Nitsch *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 305-339 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Rupture of individual fibers, microcracks in the matrix, and loss of adhesion at the fiber-matrix interface of laminates made of carbon fiber reinforced epoxy resins were studied by fractography. The topography of the fracture surfaces of the tension-loaded neat resin is seen to depend on the curring process and moisture content. Microcracks form in curing cycles with low heating rates. Curing cycle and moisture content affect the strain capability of the resin. With a known curing cycle it is possible to deduce the moisture content of a specimen or, with a known moisture content, the nature of the curing cycle. In fiber-reinforced laminates the influence of curing cycles, test temperature, and moisture content on the matrix microstructure and on the fiber-matrix interface are identifiable. An attempt to qualify the fiber-matrix adhesion in terms of the mean length of the pulled-out fibers is promising. Author (ESA)

N86-19397# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
FRACTURE MECHANICS ASPECTS
H. W. Bergmann and H. Eggers *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 341-349 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

Limits of fracture mechanics principles developed to describe the initiation and progression of cracks in isotropic and homogeneous materials when applied to fiber-reinforced laminates are discussed. Instead of a single crack, a damage zone develops in which the laminate progressively deteriorates. Fissuring and meandering cracks extending through the thickness of the material form only shortly before ultimate failure, i.e., after the useful life of the laminate. Damage mechanics must describe behavior of damaged zones in fiber-reinforced structures prior to ultimate failure. Generally accepted concepts of damage mechanics are rare. Individual mechanisms of damage progression are known but their contributions, single or in combination, to the total state of damage are not well understood. Research is directed toward the definition of characteristic strength parameters for carbon fiber reinforced resins by a combination of analysis and test. Author (ESA)

N86-19398# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
EVALUATION OF FRACTURE MODELS
J. Awerbuch *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 351-371 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

In order to assess the range of applicability and the accuracy of fracture models, the notch sensitivity of composite laminates containing centrally located holes and straight cracks, and subjected to uniaxial loading was reviewed. Eleven fracture models were evaluated against experimental data. Experimental notched strength parameters were compared with the predictions of each fracture model. Author (ESA)

N86-19399# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
MECHANISMS OF FRACTURE
R. Prinz *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 373-411 refs (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

The development of fatigue damage in unnotched multidirectional laminates was investigated under tension and compression cycling to gain insight into the mechanisms of the failure processes. During and after fatigue loading specimens were examined for damage growth using light microscopy, scanning electron microscopy, ultrasonic C-scans and X-radiography. Matrix cracking and edge delaminations are found to be the dominant types of

defects. Under fatigue loading these defects propagate due to unfavorable interlaminar stresses to the point where the specimens ultimately fail by short buckling or shearing. The test effort was accompanied by finite element calculations for the assessment of the state of stress in critical zones. A damage growth model for edge delaminations which correlates well with the test results was developed. Author (ESA)

N86-19400# Illinois Univ., Urbana. Dept. of Ceramic Engineering.
INFLUENCE OF ALUMINA ON THE STRUCTURE AND MECHANICAL PROPERTIES OF YTTRIA STABILIZED ZIRCONIA COMPOSITES Final Report, 10 Jan. 1984 - 10 Jan. 1985
R. C. Buchanan and W. W. Davison 22 Jul. 1985 33 p
(Contract N00014-80-K-0969)
(AD-A159994; TR-11) Avail: NTIS HC A03/MF A01 CSCL 11/4

Composite structure of yttria (4.5 wt%) stabilized zirconia (YSZ) with added Al2O3 (0.3-7.5 wt%) have been investigated. They show fracture toughness (Klc) and strength (MOR) values in excess of 9.0 MPa X the square root of M and 500 MPa respectively more than twice that normally reported for YSZ samples of like composition. Starting materials used were floated Al2O3 and precipitated YSZ powders (approx. 99.9% purity) of average partical size 0.03 micrometers. The powders were washed, dispersed, ball milled, spray dried, dry pressed and the resultant compacts sintered at 1300 C/8 h. Microstructures obtained were of uniform grain size (0.2-0.4 micrometers) with discrete Al2O3 inclusions, approximately the same size as the YSZ grains, dispersed throughout the composite structure. The strengthening mechanism involved dissipation of strain energy by plastic deformation of the Al2O3 inclusions in the YSZ matrix. Variation in the mechanical properties and structure of the composite as a function of added Al2O3 was correlated with DC conductivity, X-ray diffraction and lattice parameter data. The X-ray data showed splitting of the main peaks indicating a primarily tetragonal phase. Lattice parameter changes with increasing Al2O3 were attributed to direct substitution of Al(3+) for Zr(4+) ions at low Al2O3 (0.325 wt%) content resulting in increased oxygen vacancies, higher conductivity and lower activation energy. GRA

N86-19401# Army Materials and Mechanics Research Center, Watertown, Mass.
THERMAL ANALYSIS CHARACTERIZATION OF ELASTOMERS AND CARBON BLACK FILLED RUBBER COMPOSITES FOR ARMY APPLICATIONS Final Report
R. E. Sacher, D. P. Macaione, and R. E. Singler Jun. 1985 37 p
(AD-A160825; AMMRC-TR-85-14) Avail: NTIS HC A03/MF A01 CSCL 11/10

A number of elastomeric based materials used in Army tank track pads have been analyzed by a variety of thermal analysis techniques which include thermogravimetric analysis, differential scanning calorimetry, thermomechanical analysis, and dynamic mechanical analysis. These measurements have been developed to yield data concerning the chemical composition of the complex elastomer system, the cure chemistry and conversion of the rubber, the glass transition temperature(s) of the elastomers, the tensile storage modulus as a function of temperature, and the use of thermogravimetric analysis as a quality control procedure for track pads. GRA

N86-19402# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
IMPACT CHARACTERIZATION OF NEW COMPOSITE MATERIALS Final Report
Lee W. Gause and Leonard J. Buckley Feb. 1985 147 p
(AD-A160953; NADC-85023-60) Avail: NTIS HC A07/MF A01 CSCL 11/4

Dropped-weight instrumented impact tests were used in conjunction with ultrasonic C-scan inspection to characterize the impact response of several new graphite-fiber composite material systems. The AS4/Hercules 3501-6 graphite/epoxy was compared to the newer AS4/Hercules 2220-1, Celion High Strain/Narmco 5425 and IM6/Narmco 5445C systems in the 250 F (121 C) service category. Material tested in the XAS/Hysol 9102 and HX/Hexcel 1516 graphite/bismaleimides. A material ranking is given along with measured impact parameters and impact energy versus damage relationships. The impact behavior of all four 250 F (121 C) were similar except IM6/5245C had the highest impact resistance. The bismaleimides had similar incipient damage levels as the epoxies but were more easily punctured. Impact resistance of the five 350 F (177 C) systems were similar except T300/130B had the lowest impact resistance. GRA

N86-19403# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IMPREGNATION OF ALUMINIUM-ALLOY COMPOUNDS WITH CARBON MATERIALS
L. Jingxiu 24 Oct. 1985 8 p Transl. into ENGLISH from Runhua Yu Mifeng (China), no. 2, 1983 p 40-41
(AD-A161179; FTD-ID(RS)T-1488-84) Avail: NTIS HC A02/MF A01 CSCL 11/4

Sintered porous carbon substrate is mainly composed of graphite, coke and pores. It can be used as a substrate for composite materials. The composite material of carbon and aluminum alloy can be made by immersing the compressed and sintered carbon substrate in molten aluminum alloy under a fixed pressure, which forces the molten alloy to flow into the pores of the substrate. The surface of the material under such compressed condition should have a stress of 5 to about 15 Kg/sq mm. GRA

N86-19404# Denver Univ., Colo. Dept. of Engineering.
DAMAGE PROGRESSION IN FIBER COMPOSITES DURING REPEATED LOADING Final Report
M. A. Hamstad 15 Apr. 1985 19 p
(Contract W-7405-eng-48)
(DE85-017282; UCRL-15708) Avail: NTIS HC A02/MF A01

Preliminary tests to study the damage progression during load cycling of Kevlar 49/epoxy tensile strands are reported. Only a preliminary analysis of the data was accomplished. DOE

N86-19405# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
RELAXATION DUE TO TEMPERATURE, MOISTURE AND EXTERNAL LOADING: PRELIMINARY RESULTS
M. L. C. E. Verbruggen Nov. 1983 43 p refs
(VTH-M-491) Avail: NTIS HC A03/MF A01

The influence of temperature, moisture, and external loading on the internal stress distribution of ARRAL was examined by measuring the radius of a specimen after chemical milling one sheet away. There is a discrepancy between the theoretical and measured internal stress distribution as a result of the prestrain process, whereby the real stresses are higher than calculated. Large individual differences between specimens milled out of one plate after prestraining indicate a nonuniform stress distribution in the plate as a result of the prestrain process. No relaxation is observed after up to 12 weeks of exposure, independent of the environment, temperature level and external loading condition, except for 1 case (70 C, wet, unloaded). Author (ESA)

N86-19406# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE MOISTURE ABSORPTION OF ARALL COMPARED TO CARBON AND ARAMID REINFORCED COMPOSITES
M. L. C. E. Verbruggen May 1984 18 p ref
(VTH-M-506) Avail: NTIS HC A02/MF A01

Moisture absorption of ARALL, carbon fiber reinforced plastic (CFRP), and aramid fiber reinforced plastic (AFRP) are compared, based on diffusion coefficients. The roles of the fibers, material thickness, and diffusion barriers (aluminum sheets in ARALL configuration) in the general absorption mechanism are emphasized. For thin skins, ARALL has a negligible moisture absorption rate compared to composites and no difference in absorption rate is present between CFRP and AFRP. The absorption process is resin dominated. For larger thickness, the fibers have a serious contribution in the absorption behavior of the material (AFRP higher

absorption rate than CFRP) and the advantage of ARALL compared to composites is decreasing. Author (ESA)

N86-19407# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE INELASTIC RATIO OF ARALL
M. L. C. E. Verbruggen May 1984 8 p
(VTH-M-507) Avail: NTIS HC A02/MF A01

The inelastic ratio (IR) of ARALL was determined in bending tests on four configurations with varying length, width, thickness, fiber orientation, and number of layers. The IR is 65%, differences between the configurations are negligibly small. The small difference in IR between specimens with fibers in length and width direction is the result of the different elastic-plastic behavior of the specimens. The elastic part of the force-displacement curve is controlled by the Young's modulus of the specimens which is a function of the composition of the material. With increasing deflection, the stresses in the aluminum sheets are identical for all specimen configurations (the total stresses are not) so the deflection at which plastic deformation occurs is identical for all configurations. Specimens with fibers in width direction have a plastic behavior controlled by the aluminum sheets and can be regarded as ideal plastic. The elastic contribution of the fibers of specimens with fibers in length direction on the force-deflection curve in the plastic range is considerable, giving a lower IR.
Author (ESA)

N86-19408# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
RELAXATION DUE TO TEMPERATURE, MOISTURE AND EXTERNAL LOADING Final Report
M. L. C. E. Verbruggen Sep. 1984 16 p refs
(VTH-M-522) Avail: NTIS HC A02/MF A01

The influence of temperature, moisture, and external loading on the internal stress distribution of ARRAL was examined by measuring the radius of a specimen after chemical milling one sheet away. After 56 weeks exposure no significant relaxation is detected, except for specimens exposed at a 70 C, distilled water environment, which show relaxation whereby the dominant influence of the moisture is present in a continuous increase of the radius (decrease of the internal stresses) from the center to the edges of the specimen. Because of initial manufacture problems (the prestrain process did not result in a homogeneous distribution of the internal stresses) and experimental problems of controlling the chemical milling process, the scatter in the data is considerable. The results should therefore only be used on a qualitative base and show that similar tests are only valid if large test series are introduced over long exposure periods to eliminate the encountered problems. Author (ESA)

N86-19409# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
PRESTRAIN PROCESS OR ARALL
M. L. C. E. Verbruggen and R. Reumerman Sep. 1984 23 p ref
(VTH-M-523) Avail: NTIS HC A02/MF A01

The homogeneity of the stress distribution in ARALL as the result of the prestrain process is examined as well as the influence of clamping conditions on this homogeneity. The usefulness of an inspection method of the prestrain process by chemical milling is investigated. Tests show that the prestrain process results in a homogeneous distribution of the internal stresses along the ARALL-sheet. Inadequate clamping causes deviations in the stress distribution near the clamping edges of the specimen. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N86-19410 New South Wales Univ., Kensington (Australia).
SHOCK TUBE STUDIES OF HYDROCARBON PYROLYSIS Ph.D. Thesis Abstract Only
Ronald James Denning Dec. 1984 2 p
Avail: Issuing Activity

The high temperature pyrolysis of methane, ethylene, propane, ethyl iodide and 1,3-butadiene as mixtures of > 1% in argon were studied behind reflected shock waves over the temperature range 1400 to 2300 K, dependent on the hydrocarbon being studied, at densities of (2.5 to 4.9) x 1/100000 mol/cu cm. The reaction was followed by simultaneous time-resolved spectroscopy at 216 nm where methyl radical absorbs and 239 nm. The observed absorption profiles were modelled by using forward and reserve reaction rate constants which use the Gear predictor-corrector method for solving stiff differential equations. The absorption spectrum of cis-1,3-butadiene and the vinyl radical were determined between 210 and 260 nm at 1400 K for cis-1,3-butadiene and at 1350 K for the vinyl radical. The cis-1,3-butadiene shows a maximum at 240 nm with a molar absorption coefficient of 1.24 x 10,000 sq cm/mol. Vinyl radical also has a maximum at 240 nm with a molar absorption coefficient of 1.8 x 10,000 sq cm/mol. E.A.K.

N86-19411 New South Wales Univ., Kensington (Australia).
ANALYTICAL AND STRUCTURAL STUDIES OF CARBOHYDRATES M.S. Thesis Abstract Only
Grace Ya-Ling Teng [1984] 3 p ref
Avail: Issuing Activity

Three separate areas of carbohydrate analysis are examined: (1) Oligosaccharide separation on reversed-phase HPLC columns has been examined using a range of aqueous solvents. Addition of surfactants, tetramethyl urea, and organic solvents to the mobile phase causes faster elution of oligosaccharides and allows the separation of the larger oligomers in an acceptable time. Addition of neutral inorganic salts increases the retention factors. The mechanism operating in the separations approximates that invoked in the solvophobic theory of reversed phase chromatography. (2) The methyl glycosides of maltotriose, isomaltose and isomaltotriose have been prepared by their treatment with 1% methanolic HCl at room temperature. Isolated glycosides were characterization. (3) Some methods of methylation have been performed on various carbohydrates, including confirmation of the structure of a pentasaccharide obtained by the enzymic hydrolysis of a dextran.
F.M.R.

N86-19412 New South Wales Univ., Kensington (Australia).
HIGH PERFORMANCE LIQUID CHROMATOGRAPHY OF METAL DIETHYLDITHIOCARBAMATE COMPLEXES M.S. Thesis Abstract Only
Aung Kyaw Htoon Mar. 1985 3 p
Avail: Issuing Activity

High Performance Liquid Chromatography (HPLC) of diethyldithiocarbamates was studied with emphasis on the metals Ni(2), Co(2), Cr(3), Se(4), Cu(2), Hg(2), Pb(2), Cd(2), Zn(2), As(3), Fe(3) and Mn(2). These chelates were studied with various mobile phases containing ligand, EDTA and buffers using a variety of columns. It was found that Ni(2), Co(3), Cr(3), Se(4), Cu(2) and Hg(2) chelates were stable enough for trace analysis work. The remainder of the metal chelates examined showed decomposition on the column. The optimal mobile phase for the separation of these six stable chelates was methanol-acetonitrile-water on a 10 micrometers C18 Radial Pak column, or methanol-tetrahydrofuran-water on a 5 micrometers C18 Resolve column. Under these conditions, problems were encountered with elevated baselines, particularly

with the Hg(2) chelate when acetonitrile was present as part of the mobile phase. In addition, instability of the Cu(2) chelate in tetrahydrofuran was observed and difficulty was encountered in resolving Cu(2) and Se(4) chelates. These problems are overcome when an alternative mobile phase of methanol-water is used with a 10 micrometer C18 micro Bondapak column for the separations of Ni(2), Co(3), Cr(3), Cu(2) and Hg(2) with ultraviolet detection.
E.A.K.

N86-19413* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVICE AND METHOD FOR FRICTIONALLY TESTING MATERIALS FOR IGNITABILITY Patent
Frank J. Benz (Lockheed Engineering and Management Services, Inc., Las Cruces, N. Mex.), Randall C. Shaw (Lockheed Engineering and Management Services, Inc., Las Cruces, N. Mex.), and David S. Dixon, inventors (to NASA) Issued 31 Dec. 1985 7 p Filed 17 Jan. 1984 Sponsored by NASA
(NASA-Case-MSC-20622-1; US-Patent-4,561,784; US-Patent-Appl-SN-571616; US-Patent-Class-374-8; US-Patent-Class-73-7; US-Patent-Class-374-46; US-Patent-Class-422-78; US-Patent-Class-436-155;) Avail: US Patent and Trademark Office CSCL 21B

Test apparatus for determining ignition characteristics of various metal in oxidizer environments simulating operating conditions for materials is invented. The test apparatus has a chamber through which the oxidizing agent flows, and means for mounting a stationary test sample therein, a powered, rotating shaft in the chamber rigidly mounts a second test sample. The shaft is axially movable to bring the samples into frictional engagement and heated to the ignition point. Instrumentation connected to the apparatus provides for observation of temperatures, pressures, loads on and speeds of the rotating shaft, and torques whereby components of stressed oxygen systems can be selected which will avoid accidental fires under working conditions. NASA

N86-19414 Illinois Univ., Urbana.
EXPERIMENTAL AND THEORETICAL STUDIES OF NUCLEAR GENERATION OF OZONE AND ITS PHOTOLYSIS INTO SINGLET DELTA OXYGEN Ph.D. Thesis
Hani Elsayed Elsayed-Ali 1985 294 p
Avail: Univ. Microfilms Order No. DA8521758

A series of measurements of ozone yield in nuclear induced oxygen ion and O2-SF6 discharges are reported. The discharges were created by bombardment with energetic particles from the B10(n, alpha)7Li reaction. Continuous irradiation at dose rates of 10 to the 15th power to 10 to the 17th power eV/cu cm/s and pulsed irradiation (approx. 10 ms FWHM) at a peak dose rate of approx. 10 to the 15th power to 10 to the 17th power eV/cu cm/s 10 to the 20th power eV/cu cm/s were conducted. At the lower dose rates, SF6 addition generally increased the ozone yield due to the slowing of ozone destruction by negative oxygen and ozone ions. In contrast, at the high dose rates. SF6 addition decreased the observed ozone concentration due to its suppression of atomic oxygen formation by ion-ion recombination. A numerical model was developed and applied to experimental conditions. The steady-state ozone concentration was found to be limited by the reaction O3 - + O3 yields 2O2 + O2 - for which a rate coefficient of approx. 1 x to the minus 12 cu cm/s gives a good fit to the experimental data. A simplified analytical model of steady-state conditions was used to predict model sensitivity to various parameters. In addition to dose rate effects, pressure and temperature effects on ozone production were discussed.
Dissert. Abstr.

N86-19415 Illinois Univ., Urbana-Champaign.
THE EFFECT OF HYDROGEN ON THE MICROSTRUCTURE OF SILICON CARBIDE Ph.D. Thesis
Gary Scott Fischman 1985 233 p
Avail: Univ. Microfilms Order No. DA8521764

The effect of hydrogenation on the microstructure of a pressureless sintered silicon carbide was studied. Samples which were annealed in a 40:60 mole% H2Ar atmosphere at 1400 C for 50 hours were microstructurally compared with unannealed samples and samples that had been annealed in a similar manner but using an argon atmosphere. The results were also compared with microstructural results obtained from in situ studies using both hydrogen and argon atmospheres. These results were compared with a thermodynamic model which was constructed using a free energy minimization technique. The observed effects of hydrogenation were surface decarburization and amorphization throughout the silicon carbide material. Other observations include the thermally induced growth of microcrystalline silicon and accelerated amorphization around the silicon microcrystals in samples used in hydrogen in situ studies. An analysis of the microstructure of the reference material was also performed. Dissert. Abstr.

N86-19416# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
A REVIEW OF THE LITERATURE ON THE GASEOUS PRODUCTS AND TOXICITY GENERATED FROM THE PYROLYSIS AND COMBUSTION OF RIGID POLYURETHANE FOAMS
Maya Paabo and Barbara C. Levin Dec. 1985 114 p refs Sponsored in part by the US Consumer Product Safety Commission, Bethesda, Md.
(NBSIT-85-3224) Avail: NTIS HC A06/MF A01

The literature on rigid polyurethane foam has been reviewed with an emphasis on the gaseous products generated under various thermal decomposition conditions and the toxicity of those products. Carbon monoxide (CO) and hydrogen cyanide (HCN) were the predominant toxicants found among more than 100 other gaseous products. The generation of CO and HCN was found to increase with increasing combustion temperatures. Many test methods were used to assess the acute inhalation toxicity of combustion products from various rigid polyurethane foams. Lethality, incapacitation, physiological, and biochemical parameters were employed as biological end points. In general, the combustion products generated from rigid polyurethane foam in the flaming mode appear to be more toxic than those produced in the non-flaming mode. The LC sub 50 values for 30 minute exposures ranged from 10 to 17 mg/1 in the flaming mode and were greater than 34 mg/1 in the non-flaming mode. With the exception of one case in which a reactive type phosphorus containing fire retardant was used, the addition of fire retardants to rigid polyurethane foams does not appear to generate unusual toxic combustion products. Author

N86-19417*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A THIN FILM DEGRADATION STUDY OF A FLUORINATED POLYETHER LIQUID LUBRICANT USING AN HPLC METHOD
Wilfredo Morales 1986 27 p refs Proposed for presentation at the 1986 Annual Meeting of the American Society of Lubrication Engineers, Toronto, Ontario, 12-15 May 1986
(NASA-TM-87221; E-2886; NAS 1.15:87221) Avail: NTIS HC A03/MF A01 CSCL 07D

A High Pressure Liquid Chromatography (HPLC) separation method was developed to study and analyze a fluorinated polyether fluid which is promising liquid lubricant for future applications. This HPLC separation method was used in a preliminary study investigating the catalytic effect of various metal, metal alloy, and ceramic engineering materials on the degradation of this fluid in a dry air atmosphere at 345 C. Using a 440 C stainless steel as a reference catalytic material it was found that a titanium alloy and a chromium plated material degraded the fluorinated polyether fluid substantially more than the reference material. Author

N86-19418*# Howard Univ., Washington, D. C. Laser Chemistry Div.
PHOTODISSOCIATION DYNAMICS OF SMALL MOLECULES
W. M. Jackson and H. Okabe 4 Oct. 1985 97 p
(Grants NAGw-446; NG-5071; Contract N00014-80-C-0305)
(NASA-CR-176512; NAS 1.26:176512; AD-A160329; ONR-TR-19) Avail: NTIS HC A05/MF A01 CSCL 07E

The recent advancement of photodissociation dynamics of about 60 small molecules has been presented. The emphasis is placed on the primary photochemical process and the energy

partitioning in photofragments. Compounds discussed in this report include: Hydrogen-oxygen Compounds; Aldehydes, Ketones and Acids; Group Six Triatomic Oxides; Nitrogen-Oxygen Compounds; Nitrogen-Hydrogen Compounds; Cyanide Compounds; Sulfur containing Compounds; Halogen containing Compounds; Acetylenic Compounds. GRA

N86-19419# Pacific Northwest Lab., Richland, Wash.
INVESTIGATE LASER INDUCED DAMAGE IN OPTICAL COATINGS USING TIME RESOLVED RAMAN SPECTROSCOPY Final Report, Jan. - Nov. 1984
G. J. Exarhos Aug. 1985 41 p
(Sponsored by Air Force)
(AD-A160887; AFWL-TN-84-72) Avail: NTIS HC A03/MF A01 CSCL 20/6

Raman spectroscopy is shown to be a viable and rapid technique for characterization of laser induced damage in thin dielectric coatings of fused silica substrates. Unequivocal identification of crystalline and amorphous phases can be discerned from measured vibrational spectra. A two laser (damage-probe) technique has been developed for in situ analysis of laser coatings. Raman measurements made at long times following pulsed laser damage serve to characterize the equilibrium damage state and can be used to spatially profile the damage zone. Time resolved measurements acquired within nanoseconds following laser induced damage to optical coatings are studied by these and related Raman experiments from which mechanistic information can also be inferred. The primary mechanism of failure in titanium dioxide (TiO2) coatings results from crystalline phase changes induced thermally or by multiphoton excitation processes. A similiar failure mode is predicted for other oxidic coatings such as zirconium dioxide (ZrO2) which can exist in different room temperature stable phases. GRA

N86-19420# SRI International Corp., Menlo Park, Calif.
PRODUCTION AND PROPERTIES OF METASTABLE AUTODETACHING NEGATIVE IONS Final Scientific Report, 15 May 1982 - 14 Jun. 1985
James R. Peterson and Michael J. Coggiola 20 Aug. 1985 27 p
(Contract F49620-82-K-0030)
(AD-A161256; SRI-MP-203; AFOSR-85-0925TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

Experimental work has been directed primarily determining properties of metastable autodetaching negative ions, with a smaller effort directed to their production in beams, as well as the production and photodetachment of Li(-) beams. Properties of particular concern were the photodetachment cross sections, energy levels, and autodetachment lifetimes. Detailed studies have been made of resonant structures in the photodetachment of He(-) and Li(-) negative ions. Some previously reported metastable ions were found to be probably nonexistent, while others were given the first experimental proof, and one unpredicted species (He2(-)) was discovered. A long-lived auto-detaching form of OH(-) was also observed. Total neutralization cross sections were measured as functions of beam energy for Li(+) in Mg, Ca, Sr, and Ba, and cross sections were calculated for Li(+) + Ca. Author (GRA)

N86-19421# Amdretech Corp., Houston, Tex.
PROCESS FOR RECOVERING HYDROGEN AND ELEMENTAL SULFUR FROM HYDROGEN SULFIDE Final Report, Jul. 1981 - Jun. 1984
W. C. Chen 1984 204 p
(Contract DE-FG01-81CS-15065)
(DE85-002663; DOE/CS-15065/T1) Avail: NTIS HC A10/MF

This report presents a new process for recovering hydrogen and elemental sulfur from hydrogen sulfide. The process consists of two chemical reactions, namely: (1) H2S + I2 YIELDS 2 HI sub (aq)/ + S, and (2) 2 HI sub (g)/ YIELDS H2 + I2. Both experimental and economic studies are performed. The experimental study identifies optimal conditions under which the process is to be operated. The economic study develops the costs and assesses the commercial feasibility of the process. In the experimental study, five areas are tested: H2S absorption-reaction, sulfur recovery and purification, dehydration of hydriodic acid, decomposition of hydrogen iodide, and corrosion tests. The results show that H2S can be removed down to less than 10 ppM in the offgas of the absorber-reactor. In the economic study, process flowsheets operated under optimal conditions are developed. Capital investments for the new plant are estimated to be about $12 million. Payout time is about 6.4 years. The new process, if commercialized, would replace the existing H2S disposal process which includes: (1) H2S removal and recovery, (2) the Claus plant, and (3) Claus tail gas treatment. DOE

N86-19422# Brookhaven National Lab., Upton, N. Y.
NEW EXPERIMENTAL TECHNIQUES TO BE AWARE OF
N. E. Holden 1985 5 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001169; BNL-NCS-36963; CONF-8508138-1) Avail: NTIS HC A02/MF A01

Some years ago, the Commission on Atomic Weights asked its Subcommittee on the Assessment of Isotopic Composition (SAIC), to keep it informed of new techniques that might eventually impact on its work. The Subcommittee never formally reported to the Commission because at the time, no techniques exceeded in accuracy that of thermionic emission mass spectrometry now in use to determine isotopic abundance values. This paper attempts to provide a status report on those other techniques in the field which may or may not eventually exceed the accuracy of thermionic emission mass spectrometry. This is merely an early warning system for the use of Commission members, who might not necessarily become aware of these other techniques in any other way. There are some general categories for these techniques and the author discusses very briefly the papers, which have been published over the years, in each of the categories. Those categories are gamma-ray and alpha spectrometry, activation analysis, laser techniques, infrared spectrometry, resonance ionization mass spectrometry, electron paramagnetic resonance (EPR) hyperfine structure techniques, emission spectrometry and ion microprobe mass spectrometry. DOE

N86-19423# Brookhaven National Lab., Upton, N. Y.
SHORT HISTORY ON THE NOMENCLATURE OF CHEMICAL ELEMENTS
N. E. Holden 1985 5 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001192; BNL-NCS-36950; CONF-8508138-9) Avail: NTIS HC A02/MF A01

This paper looks at some aspects in the nomenclature of the chemical elements. A detailed history is available in the book by Weeks (M. E.Weeks, Discovery of the Elements, Fifth Edition, Journal of Chemical Education, 1945). A review of some of these aspects might help shed light on the present perplexing problem facing the Inorganic Nomenclature Commission, i.e., the problem of trivial names for the heavy elements, whose discovery has been contested by rival groups. Since each of these groups claim primacy, while rejecting the alternative claims of their rivals, is history of any help in solving this dilemna. The following conclusions can be drawn from this discussion. The problem with more than one name for an element is not a new or unique situation. Perhaps it is time to reevaluate the generally accepted solutions. Since new elements are no longer being discovered but are being synthesized, maybe the old formula of allowing the first person to find the element be given the right to name it should be abandoned. It had been suggested previously that a list of names appropriate for elements be drawn up and the Commission could put a number of these in place. Then, when a newly synthesized element is verified, the new discoverer would be allowed to contribute a name into the list for some of the future elements. DOE

N86-19424# Colorado State Univ., Fort Collins.
HETEROBIMETALLIC COMPLEXES FOR CO REDUCTION Annual Progress Report, 1 Mar. 1985 - 30 Sep. 1985
J. K. Stille 1 Oct. 1985 12 p

(Contract DE-FG02-85ER-13340)
(DE86-002147; DOE/ER-13340/1) Avail: NTIS HC A02/MF A01

Goal is to synthesize certain homogeneous heterobimetallic catalysts, containing both an early and a late transition metal, that will reduce carbon monoxide selectively under mild reaction conditions. A Pd dimer containing methyl and one Pd and hydride on the other has been isolated and shown to rapidly insert CO. This complex eliminates acetaldehyde. Complexes containing combinations of early (Nb, Mo, W) and late (Fe, Co, Rh) transition metals that could be expected to activate carbon monoxide most effectively are primary targets. A complex containing methyls on adjacent Fe and W has been synthesized and the crystal structure determined. An analagous complex containing methyl on Fe and hydride on W exists only as a transient intermediate, generating methane with the formation of a Fe-W bond. The synthesis of dinuclear complexes containing NbH3 and Re(CO)3 is in progress. DOE

N86-19425# Oak Ridge National Lab., Tenn.
ISPO TASK A-109: EVALUATION OF QUADRUPOLE MASS SPECTROMETERS AS ON-SITE INSPECTION DEVICES
D. H. Smith, H. S. McKown, and J. A. Carter Nov. 1985 15 p refs
(Contract DE-AC05-84OR-21400)
(DE86-002558; ORNL/TM-9839; ISPO-231) Avail: NTIS HC A02/MF A01

Two quadrupole mass spectrometers, a Balzers model 311 supplied by the Pernicka Corporation and a Finnigan-MAT THQ thermal ionization instrument, have been evaluated for potential application as on-site inspection devices for use by the International Atomic Energy Agency. Neither was deemed satisfactory for the intended purpose, and further refinement of either instrument will be necessary before a recommendation for acquisition can be made. DOE

N86-19426# California Univ., Riverside. Statewide Air Pollution Research Center.
EXPERIMENTAL PROTOCOL FOR DETERMINING HYDROXYL RADICAL REACTION RATE CONSTANTS FOR ORGANIC COMPOUNDS: ESTIMATION OF ATMOSPHERIC REACTIVITY Interim Report
J. N. Pitts, A. M. Winer, S. M. Aschmann, W. P. L. Carter, and R. Atkinson Jul. 1985 55 p
(PB85-238558; EPA-600/3-85-058) Avail: NTIS HC A04/MF A01 CSCL 07D

An experimental protocol for the determination at room temperature of rate constants for the reactions of hydroxyl radicals with organic chemicals in the gas phase is described in detail. This protocol provides a basis for evaluating the reactivity of organic substances which are emitted into the environment and which are consumed primarily by reaction with hydroxyl radicals. The experimental technique is based upon monitoring the disappearance rates of the test compound and of a reference organic in irradiated methyl nitrite-NO-organic-air mixtures. GRA

N86-19913*# Niigata Univ. (Japan). Dept. of Civil Engineering.
WET-OXIDATION WASTE MANAGEMENT SYSTEM FOR CELSS
Yukio Takahashi and Haruhiko Ohya (Yokohama National Univ., Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 77-84 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 07B

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N86-19427 Tulane Univ., New Orleans, La.
THEORY OF METAL SURFACE FIELD EVAPORATION Ph.D. Thesis
Edward Richard McMullen 1985 159 p
Avail: Univ. Microfilms Order No. DA8515173

The effects of intense positive electric fields applied to two metal surfaces are addressed. In particular, the outward shifting of the surface layer in response to the fields, the redistribution of electronic charge within the metal initiated by the fields, and prediction of the minimum field strength which will produce evaporation of the surface monolayer of positive charge and attendant electrons are investigated. Density functional theory, a powerful method of treating the inhomogeneous electron gas, is the theoretical approach taken. Its utility and success within the local density approximation have been proven for many systems, diverse in size and nature, including the metal surface. By positioning the surface monolayer at a particular separation measured along the surface normal and calculating the surface energy from the semi-self-consistent electronic density generated via the Schrodinger equation with a one-electron effective potential, and repeating the procedure for other separations, an energy-displacement curve for a particular applied field can be mapped. A minimum in the curve for fields less than the least required for field evaporation locates the equilibrium position of the surface layer. The minimum will just disappear for the critical field. Author

N86-19428 California Univ., Irvine.
CREEP BEHAVIOR AND SUBSTRUCTURE OF Al AND Al-Zn ALLOYS AFTER STRESS-REDUCTION Ph.D. Thesis
Mostafa Sinnary Mostafa 1985 165 p
Avail: Univ. Microfilms Order No. DA8516551

The creep behavior of metals and alloys of the metal class following the stress reduction is studied. Stress-reduction and uninterrupted experiments were conducted on Al, Al-2wt%Zn, and Al-5wt%Zn in the temperature range of 0.61 TM to 0.99 Tm, where Tm is the melting point, and at a normalized stress range extending from 2 x .0001 G to 2 x .001 G. Stress reduction ratios tau sub 1 is the reduced stress, ranging from 0.05 to 0.75 were used. The stress exponent inferred from stress-reduction experiments, n*, was compared with that obtained from uninterrupted tests, n. On the basis of this comparison, three regions of behavior, depending on temperature were identified. The three temperature domains, identifying the three types of behavior (normal, mixed, and abnormal), shift to higher temperatures as Zn concentration in Al increases. It is suggested that the discrepancy between n* and n at intermediate temperatures (small reductions) and low temperatures (all reductions) may arise from impurity atom segregation at subboundaries and their interference with subboundary migration after the stress reduction. Dissert. Abstr.

N86-19429 Drexel Univ., Philadelphia, Pa.
A FUNDAMENTAL STUDY OF P/M PROCESSED ELEVATED TEMPERATURE ALUMINUM ALLOYS Ph.D. Thesis
M. K. Premkumar 1985 228 p
Avail: Univ. Microfilms Order No. DA8517064

Power processing, involving controlled atomization and hot consolidation, provides a means for fabricating improved dispersion strengthened aluminum alloys for elevated temperature service. To this end, microstructure-processing-property relationships in rapidly solidified Al-Fe-Ni alloys with FeNiAlg dispersoid volume fractions of 0.19, 0.25 and 0.32 were determined. Specifically, the emphasis was on microstructural stability, elevated temperature tensile behavior and creep response. Air atomized powder was consolidated to full density by vacuum hot pressing and/or hot extrusion. In addition, one powder composition was mechanically alloyed. Powder and consolidate were characterized by means of optical and transmission electron microscopy, scanning electron microscopy, X ray diffraction and differential scanning calorimetry. Ambient and elevated temperature tensile tests and creep tests were conducted at temperatures up to 400 C. Dissert. Abstr.

N86-19430 Carnegie Inst. of Tech., Pittsburgh, Pa.
KINETIC STUDY OF THE NITROGEN REACTION WITH LIQUID IRON ALLOYS Ph.D. Thesis
Peter C. Glaws 1985 146 p refs

Avail: Univ. Microfilms Order No. DA8517521

The modified Sieverts' and the isotope exchange technique were employed in the current investigation of the kinetics of the nitrogen reaction with liquid iron solutions at 1600 C. It was found that the presence of the surface active element sulfur, significantly retards the rate of the nitrogen reaction up to approximately 0.2 wt pct, where in Fe-S alloys the reaction rate levels off and becomes independent of sulfur concentration. Agreement between results from both modified Sieverts' and isotope exchange experiments, performed on Fe-S alloys in which both techniques provide a high degree of accuracy, indicates that the dissociation of the nitrogen molecule is the rate limiting step in the intrinsic chemical reaction mechanism of nitrogen absorption. Chromium in solution with liquid iron increases the rate of nitrogen dissolution. While nickel and carbon were shown to have no significant effect on the kinetics. The rate promoting effect of chromium in Fe-Cr-S alloys is, in part, due to the rate of N2 dissociation being faster on the chromium surface sites than on iron surfaces sites. A mathematical model based on a mixed interfacial reaction and liquid phase mass transfer controlled rate for nitrogen absorption into liquid iron alloys was developed. The calculated absorption curves are in good agreement with current and previous experimental data. Dissert. Abstr.

N86-19431 New South Wales Univ., Kensington (Australia).
A STUDY OF TUNGSTEN (001) SURFACE USING LOW ENERGY ELECTRON DIFFRACTION AND OTHER ELECTRON SPECTROSCOPIES Abstract Only
Marion Anne Stevens Kalceff Dec. 1984 3 p
Avail: Issuing Activity

The properties of the clean Tungsten (001) surfaces and the effects of the common absorbates Hydrogen and Oxygen were investigated using the techniques of low energy electron diffraction, auger electron spectrocopy and characteristic electron energy loss spectroscopy. The origins of features observed in characteristic energy loss spectra, very low energy secondary electron emission spectra and low energy Auger spectra, are deduced and compared with recent relevant independently obtained theoretical data and with other, sometimes conflicting, analyses. The use of these spectroscopies as monitors of surface cleanliness is evaluated. In particular a previously unreported emission, observed during oxygen adsorption, is attributed to an Auger transition involving the oxygen 2s and 2 p adsorbate levels. Author

N86-19432 Alabama Univ., University.
AN ANALYSIS AND EVALUATION OF THE DYNAMIC FLOW FUNCTION OF METALS UNDER IMPACT Ph.D. Thesis
Moon Saeng Kim 1985 115 p
Avail: Univ. Microfilms Order No. DA8519395

The objective of this research is to analyze and evaluate the dynamic flow function of metals under impact loading at both high strain rate (over 1000/s) and large strain (over 100%). A test method for dynamic compression of metal disc is described. A long steel striker (20 inches long, 1 inch diameter) impacts a small copper specimen placed on a massive anvil. The velocity of the striker face and the force on the anvil are measured during the impact period. From these primitive data the axial stress, strain, and strain rate of the disc are obtained. The strain rate is determined by the striker velocity divided by the specimen height. This gives a slightly increasing strain rate over most of the deformation period. Strain rates of 100 to 10,000 per second are achieved. Attainable final strans are 150%. Dissert. Abstr.

N86-19433 Brown Univ., Providence, R. I.
RF SPUTTERING OF COPPER INDIUM SELENIDE THIN FILMS Ph.D. Thesis
Christopher John Case 1985 123 p
Avail: Univ. Microfilms Order No. DA8519817

Thin films of copper indium selenide were prepared by RF sputtering. A novel cathode was designed and constructed to ensure that the sputtering target remained cool and did not decompose. The sputtering targets were prepared by reacting stoichiometric mixtures of the elements in evacuated sealed quartz ampoules. Copper indium selenide films sputtered on substrates between 400 C and 500 C exhibited the chalcopyrite structure while films sputtered on substrates above and below this temperature had the sphalerite structure. The composition of the films as determined by EDAX was closest to stoichiometric at a substrate temperature of 420 C. Pulsed nmr measurements were performed on bulk copper indium selenide. The spin-lattice relaxation occurs via a two-phonon Raman process at temperatures below 550 K and the process is dominated by copper diffusion above this temperature. The activation energy for copper diffusion was found to be 0.64 eV, about one half the value obtained by motional narrowing studies of copper indium sulfide. Dissert. Abstr.

N86-19434 Cornell Univ., Ithaca, N.Y.
ACOUSTIC EMISSION SOURCE CHARACTERIZATION OF FATIGUE CRACKS IN 7075-T6 ALUMINUM ALLOY THIN PLATE Ph.D. Thesis
Chi-Ping Chen 1985 146 p
Avail: Univ. Microfilms Order No. DA8517002

Acoustic emission signals were recorded and analyzed from cracks that were generated by fatigue loading in a compact tension specimen of 7075-T6 aluminum alloy thin plate. The location of each AE source was assumed to be at the crack tip, and the crack length at the time of each signal was measured by both electrical and optical methods. The signals for each acoustic emission event were simultaneously recorded at multiple transducers. For the data analysis, a moment tensor representation of a dynamic crack was assumed and its validity investigated. Each component of the moment tensor was assumed to have the same time dependence. Hence, for a linear system, the response of the structure is the convolution of a source time function with a linear combination of the Green's functions, where each has a coefficient equal to the magnitude of the corresponding moment tensor component. If the response and the Green's functions are given, the moment tensor can be obtained by signal deconvolution. Dissert. Abstr.

N86-19435*# Clarkson Univ., Potsdam, N.Y. Dept. of Chemical Engineering.
STUDY OF EUTECTIC FORMATION Final Report, 3 May 1982 - 2 Aug. 1984
William R. Wilcox, G. F. Eisa, V. Baskaran, and Donald C. Richardson Aug. 1984 33 p refs
(Contract NAS8-34887)
(NASA-CR-178705; NAS 1.26:178705) Avail: NTIS HC A03/MF A01 CSCL 11F

A theory was developed for the influence of convection on the microstructure of lamellar eutectics. Convection is predicted to produce a coarser microstructure, especially at low freezing rates and large volume fractions of the minority phase. Similary convection is predicted to lower the interfacial undercooling, especially at low freezing rates. Experiments using spin-up/spin-down were performed on the Mn-Bi eutectic. This stirring had a dramatic effect on the microstructure, not only making it coarser but at low freezing rates also changing the morphology of the MnBi. The coarsering persisted to moderately high freezing rates. At the lowest freezing rate, vigorous stirring caused the MnBi to be concentrated at the periphery of the ingot and absent along the center. Progress was made on developing a technique for revealing the three-dimensional microstructure of the MnBi eutectic by time-lapse videotaping while etching. Author

N86-19436# Army Materials and Mechanics Research Center, Watertown, Mass.
COMPARISON OF BALLISTIC PERFORMANCE OF A SPLIT HEAT OF ESR AND VAR 4340 STEEL Final Report
C. F. Hickey, Jr., T. S. Thomas, and A. A. Anctil Jul. 1985 30 p
(DA Proj. 1L1-62105-AH-84)
(AD-A160924; AD-F630624; AMMRC-TR-85-20) Avail: NTIS HC A03/MF A01 CSCL 19/4

A split argon-oxygen decarburized (AOD) heat of 4340 steel was used to compare the relative effectiveness of the VAR (Vacuum Arc Remelting) and ESR (Electroslag Remelting) processes on ballistic performance. Forgings of VAR and ESR

4340 steel were rolled into plates with thicknesses of 0.64, 0.81, 0.96, 1.12, and 1.27 cm (0.25, 0.32, 0.38, 0.44, and 0.50 inch). Plates were heat treated to a tempered martensite microstructure by oil quenching and then tempering at 163, 171, 191, or 204 C (325, 340, 375, or 400 F). The protection limit (V sub 50) for a .50 caliber AP M2 threat was determined for ESR and VAR 4340 steel plates of several thickness-tempering temperature combinations. Results indicate that over the thickness range studied the protection limit for ESR 4340 steel tempered at 171 C (340 F) is equal to or greater than that of the VAR 4340 steel. Also, within the tempering temperature range studied the 171 C (340 C) temper provides the greatest protection against the .50 caliber threat for 0.64-cm (0.25 inch) thick ESR 4340 steel plates. There is a greater tendency for VAR processed 0.64-cm (0.25 inch) thick plates tempered at 163 and 171 C (325 and 340 F) to crack when impacted by this threat then comparable ESR processed plates. Further, for both ESR and VAR 4340 steel plates tempered at 171 C (340 F) it is found that the penetration mechanism gradually changes from petalling to plugging as plate thickness increases. GRA

N86-19437# Naval Research Lab., Washington, D. C.
ELECTROCHEMICAL PROPERTIES OF PALLADIUM AND PLATINUM PHOSPHINE COMPLEXES
J. M. Calvert, B. H. Berrie, R. J. Nowak, and J. C. Cooper 30 Sep. 1985 35 p
(AD-A160996; NRL-MR-5660) Avail: NTIS HC A03/MF A01 CSCL 07/4

The electrochemistry of 11 palladium (II) and platinum (II) complexes of the type ML2X2(L = P, N, or C-donor; X = Cl or I) was examined by cyclic voltammetry in nonaqueous solution. Electrochemical reduction was irreversible and was coupled with loss of X(-). Equilibria between the metal complexes and added L significantly altered the observed electrochemistry. Reduction peak potentials for a homologous series of complexes qualitatively reflected expected ligand field strengths. Agreement was also found between the optical d-d transition energy and the electrochemical reduction potential for selected complexes. Trans-isomers were harder to reduce than cis-isomers by about 300 mV. A shift of approximately 400 mV to more negative potentials was determined for the reduction of Pt(II) for complexes with identical coordination environments. Saturation of the solution with carbon dioxide had no effect on the cyclic voltammetric behavior of the complexes. GRA

N86-19438# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Metallurgical Engineering.
DISPERSION STRENGTHENING Annual Letter Report
George S. Ansell and Gary Judd 1 Oct. 1985 6 p
(Contract N00014-85-K-0058)
(AD-A161089) Avail: NTIS HC A02/MF A01 CSCL 11/6

The purpose of this program is to develop a fundamental understanding of the role of finely dispersed second phase particles upon the properties of crystalline solids. The scope of this work has been directed towards studying the strengthening behavior of nickel-base superalloys, the strength of ferrous martensite, and the kinetics of the austenite to martensite transformation. The studies have focussed on the fundamental aspects of these two-phase systems that appear to control the structural characteristics and mechanical response of these important classes of engineering materials. GRA

N86-19439# Naval Postgraduate School, Monterey, Calif.
THE VARIATION IN THE SUBGRAIN SIZE IN ALUMINUM DEFORMED TO LARGE STEADY-STATE CREEP STRAINS M.S. Thesis
Paul P. Mieszczanski Sep. 1985 51 p
(AD-A161239) Avail: NTIS HC A04/MF A01 CSCL 11/6

Pure metals(and many alloys) deformed at high (creep) temperatures strain-harden. This hardening is associated with an increase in the density of randomly arranged (forest) dislocations and subsequent formation of a three-dimensional network of low-angle dislocation boundaries (subgrains). Eventually a material reaches a steady-state condition, and hardening and recovery processes are balanced. A controversy exists as to which of these features is primarily responsible for creep resistance or strength. During steady-state deformation, the feature responsible for creep strength is expected to be invariant with strain. Some stainless steel work suggested that the subgrain size changes during steady-state. Therefore, it is believed that subgrain strengthening is not dominant in this material. Aluminum specimens are deformed to transmission electron microscopy to determine the average subgrain size. GRA

N86-19440# Lawrence Livermore National Lab., Calif.
AUSTENITIC STAINLESS STEELS FOR CRYOGENIC SERVICE
E. N. C. Dalder and M. C. Juhas 19 Sep. 1985 109 p
(Contract W-7405-eng-48)
(DE86-001304; UCRL-92882) Avail: NTIS HC A06/MF A01

Presently available information on austenitic Fe-Cr-Ni stainless steel plate, welds, and castings for service below 77 K are reviewed with the intent (1) of developing systematic relationships between mechanical properties, composition, microstructure, and processing, and (2) of assessing the adequacy of these data bases in the design, fabrication, and operation of engineering systems at 4 K. DOE

N86-19441# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
MICROSTRUCTURAL AND MICROMECHANICAL RESPONSE IN AUSTENITIC STAINLESS STEEL OVERLAYS ON LOW ALLOY STEEL PLATE Final Technical Report, 1 Jul. 1982 - 30 Sep. 1984
E. Rosa, P. Choi, and J. Moteff 10 Jun. 1985 147 p refs
(Contract DE-AC05-84OR-21400)
(DE86-002163; UC/MSME-22279-12) Avail: NTIS HC A07/MF A01

E309/Modified 2-1/4Cr-1Mo, E347/Standard 2-1/4Cr-1Mo, and E347/E309/Standard 2-1/4Cr-1Mo weld overlays mechanical properties were investigated by microhardness means at room and elevated temperature. A method devised by Boeklen in Germany was employed to obtain the relative ductility from the indentation profile. Uniform elongations gathered from tensile tests performed at high temperatures showed a strong correlation with the ductility parameter obtained from indentations made on specimens of the same material of corresponding temperatures. Tabor's and Cahoon's models were employed and the ultimate tensile strength gathered from tensile tests performed at high temperature also showed a strong correlation with corrected values calculated from hot hardness indentations made at similar temperatures. The microindentations allowed point by point characterization of the several zones that compose the overlay weld. The characterization coupled to the methods employed in this investigation allows the assessment of both strength and uniform deformation parameters on localized areas. It has been shown that the technique used to deposit the welds on the base metal can substantially affect the weld response to plastic deformation. The point to point evaluation of the ductility parameter across the weld zone has shown that an oscillating pattern with a well defined period and amplitude is observed. Room temperature hardness evaluation after long time exposure to 1275(0)F (690(0)C) has shown that the weld and heat affected zones (HAZ) of the single layer material decreases with exposure time. In the double layer the bottom weld (E309) shows a hardness decrease, while the top weld (E347) shows a hardness increase. Calculation of the average ductility parameters over each zone has shown that the parameter for the HAZ decreases with increasing exposure times. DOE

N86-19442# Brown Univ., Providence, R. I. Div. of Engineering.
COMBINED MACROSCOPIC AND MICROSCOPIC APPROACH TO THE FRACTURE OF METALS Comprehensive Progress Report, 1979 - 1985
R. J. Asaro, J. Gurland, A. Needleman, and C. F. Shih Jul. 1985 90 p
(Contract DE-AC02-80ER-10556)

(DE86-002286; DOE/ER-10556/105) Avail: NTIS HC A05/MF A01

Effective finite element procedures for fully plastic crack analysis have been developed. The solutions obtained satisfy stringent consistency relations. They are a key ingredient in the engineering analysis of loss of stability by crack growth of flawed structures. For the prediction of crack growth rates under high temperature conditions, small and finite-deformation solutions have been obtained for the analysis of time-dependent stress and strain fields associated with the sudden loading of tensile cracks in elastic-nonlinear viscous materials. A relationship was developed between flow localization and void nucleation and growth, useful in certain cases of failure by shear localization. Finite strains numerical analysis gives an initial picture of shear-based development at a critical crack tip. In accounting for the variation of plane strain fracture toughness with heat treatment of AISI 4340 steels, it was shown that particle spacing is of primary importance in controlling toughness. A comprehensive model was developed for void nucleation at particle-matrix interfaces in particle strengthened steels. A study of deformation and fracture of dual-phase steels has shown that their exceptional ductility is related to the unfavorable conditions of void initiation and growth at deforming martensite particles. Thermodynamic models, which describe cohesion loss at interfaces due to absorption, can be applied to the transition from brittle to ductile behavior of polycrystals. In 1015 and 1045 steels, hydrogen accelerates the processes of void initiation and void growth without changing the actual mechanism of rupture. DOE

N86-19443# Oak Ridge National Lab., Tenn.
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF A 3 Cr-1.5 Mo STEEL
R. L. Klueh and A. M. Nasreldin Sep. 1985 42 p refs
(Contract DE-AC05-84OR-21400)
(DE86-002564; ORNL-6206) Avail: NTIS HC A03/MF A01

Tensile and impact properties were determined for an alloy steel (3 wt % Cr-1.5 wt % Mo-0.1 wt % V-0.1 wt % C) considered a candidate for elevated-temperature pressure-vessel applications. The steel was tested in two heat-treated conditions: normalized and tempered and quenched and tempered. Mechanical properties were determined for various tempering conditions (time and temperature) as described by a tempering parameter. Similar tempering treatments for the quenched and the normalized steels led to similar strengths. However, for the lowest tempering parameter used, the impact properties for the quenched-and-tempered steel exceeded those for the normalized-and-tempered steel, resulting in an excellent ductile-brittle transition temperature (-70(0)C) and upper-shelf energy (225 J) for the quenched-and-tempered steel at a high strength (770 MPa ultimate tensile strength). Further tempering reduced the strength of the steel in both heat-treated conditions. The impact properties of the quenched steel were only slightly changed by further tempering, but those of the normalized steel improved, eventually equaling those of the quenched-and-tempered steel. Transmission electron microscopy showed that the quenched steel formed carbide-free acicular bainite and that the normalized steel formed granular bainite. The results indicate that properties might be optimized by proper heat treatment. DOE

N86-19444# California Univ., Berkeley. Lawrence Berkeley Lab.
APPLICATION OF THE ANNNI MODEL TO LONG-PERIOD SUPERSTRUCTURES IN SOME NOBLE METAL ALLOYS
D. deFontaine, A. Finel, S. Takeda, and J. Kulik Aug. 1985 15 p Presented at the 114th AIME Annual Meeting (includes Society of Mining Engineers), New York, N.Y., 24 Feb. 1985
(Contract DE-AC03-76SF-00098)
(DE86-000625; LBL-20044; CONF-850211-16) Avail: NTIS HC A02/MF A01

The phenomenon of long-period superstructures in ordered alloys is analyzed in terms of the ANNNI model. New ground state results are presented and applied to the case of one-dimensional periodic antiphase structures in Cu3Pd. The difference between systems with diffuse antiphase domain boundaries (as in Cu3Pd) and sharp boundaries (as in Ag3Mg) is discussed and is argued to be due to the influence of the strength of the effective transverse pair interactions compared to that of the axial interactions along the long-period direction. Atomic resolution transmission electron micrographs are presented for Cu3Pd and Ag3Mg, which clearly illustrate the distinction. DOE

N86-19445# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
BONDLINE CORROSION PROPERTIES OF ARALL IN SALT SPRAY ENVIRONMENT Final Report
M. L. C. E. Verbruggen Dec. 1983 16 p refs
(VTH-M-495) Avail: NTIS HC A02/MF A01

Long term environmental tests on ARALL are summarized. No severe bondline corrosion is encountered up to 519 days of salt spray exposure. The peel strength of the adhesives continuously decreases with increasing exposure. After 519 days of exposure, losses of 30% to 50% in peel strength can be expected. No bondline corrosion is expected if all pretreatments are carefully executed. The appearance of an adhesive interface is favorable for ARALL compared with monolytic materials. If corrosion appears (and it is very hard to prevent any corrosion), the adhesive acts as a barrier and only a limited area is affected in contradiction with monolithic materials where through tickness corrosion is dangerous. Because of its composition (fibers as adhesive), the prepreg used in ARALL is a superior barrier compared with pure adhesives. Author (ESA)

N86-19446# Joint Publications Research Service, Arlington, Va.
JAPAN REPORT: SCIENCE AND TECHNOLOGY
11 Feb. 1986 77 p refs Transl. into ENGLISH from various Japanese articles
(JPRS-JST-86-003) Avail: NTIS HC A05/MF A01

This issue is devoted entirely to the science and technology of powder metallurgy in Japan. Some topics of interest are: (1) Development of titanium alloys; (2) Powder metallurgy process described; (3) Advantages of metal sintering; and (4) Conductive oxides described. For individual titles, see N86-19447 through N86-19452.

N86-19447# Joint Publications Research Service, Arlington, Va.
POWDERED, SINTERED ALLOY MATERIALS DESCRIBED: DEVELOPMENT OF TITANIUM ALLOYS
Michio Yamazaki and Hidehiro Onodera *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 1-12 refs Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 25-31 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

As part of a system for the next generation, in parallel with the development of titanium alloys to meet the target performance of strength relative to high temperature (tensile strength/specific gravity), ductility and superplasticity properties, technological advances are studied for the manufacture of products such as compressor rotors with high yield, using superplasticity processing through powder metallurgy techniques. Techniques of alloy development as well as development status are explained, together with an outline of production techniques for components being studied at the Central Research Institute of Mitsubishi Metal Corporation. Author

N86-19448# Joint Publications Research Service, Arlington, Va.
POWDERED METALLURGY PROCESS DESCRIBED
Tatsuo Fujita and Tadao Hirano *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 13-21 Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 32-26 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

The powder metallurgy process (P/M process) with rapidly solidified powder is studied. In chilling, a number of elements became soluable at an oversatulation point and crystallized to a new metastable phase. Compared with the conventional ingot

metallurgy process (I/M process), the following characteristics of the P/M process are expected to contribute to improving material properties: in chilling, precipitates are finely distributed; and because of its powdered form mixing or dispersing with other powders and fibers is comparatively easy. Although a variety of P/M alloys of the iron type have been developed and made available for practical use by making use of these characteristics, there are virtually no P/M alloys of the aluminum type. The manufacturing firms by whom the authors are employed have been engaged in the research and development of aluminum powder alloys mainly to obtain high strength and abrasion resistance. Last year, mass production and distribution of an aluminum powder alloy called SHORIK began. Its manufacturing process, properties, and examples of applications are explained. Author

N86-19449# Joint Publications Research Service, Arlington, Va.
ADVANTAGES OF METAL SINTERING
Mineo Onoda *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 21-32 refs Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 37-44 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

Sintered mild magnetic materials fall roughly into two categories; the metal type and the oxide type (ferrite). With less magnetic flux density and much higher electric resistance than the metal type, the oxide type is suited for use in the high frequency region. On the other hand, the metal type, which was studied has high saturated magnetic flux density, but high watt loss, so it is used exclusively in direct current applications. For applications requiring high magnetic flux density in the high frequency region, laminated products of silicon steel sheets are used. Machining methods that provide a high degree of freedom in terms of design and economy are being sought for mild magnetic parts. It is against this background that a second look is being taken at sintered mild magnetic parts. Author

N86-19450# Joint Publications Research Service, Arlington, Va.
DEVELOPING ABRASION-RESISTANT CERAMICS **c27**
Tadahiko Watanabe *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 33-41 Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 45-49 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

Lately, research and development of ceramics for structural use in machines has gained momentum. The development of ceramics by making use of their heat and corrosion resistant properties is studied. In addition to these properties, ceramics are very hard, strong, and light weight. Development of high abrasion resistance ceramics is possible by taking advantage of these properties. If such ceramics could be developed, applications in auto parts such as cams, tappets and valve seats, abrasion resistant tools such as wire drawing dies, and abrasion-resistant materials such as injection molding nozzles will be possible. Problems to look at when developing such very hard ceramics for use as machine parts material, will be ease of working and their ability to braze with metals. Price will naturally be a matter for serious consideration as well. Ceramics of the carbo-nitride titanium type which are introduced are good electric conductors, so that electro-spark machining is possible regardless of hardness. Silver brazing can be performed at relatively low cost, so it is considered useful in ceramics used for machine structural purpose. Author

N86-19451# Joint Publications Research Service, Arlington, Va.
TITANIUM DIOXIDE PROPERTIES DESCRIBED
Shin-ichiro Kobayashi, Kenji Yajima, and Fukuji Suzuki *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 41-53 refs Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 50-55 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

Titanium dioxide is known as white powder. The titanium compounds developed by the authors are black, although they are a type of titanium oxide. The main component is titanium monoxide, hitherto considered unstable in the atmosphere. The key to creating titanium black is the stabilizing of titanium monoxide by adding a small quantity of nitrogen. Development of unique applications not only as a black pigment but as a new material, different from titanium dioxide, is anticipated. Author

N86-19452# Joint Publications Research Service, Arlington, Va.
CONDUCTIVE OXIDES DESCRIBED **c33**
Hiroyoshi Takagi, Jyunzoh Tasaki, and Ippei Nakagawa *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 53-74 refs Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 56-66 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

Oxides used to be thought of as insulating materials. Lately, this point of view has changed, so that any oxide containing a transition element is first suspected of being an electric conductor. Some oxides have electric conductivity equal to that of silver or copper at room temperature. Even superconductive materials are available today. Depending on the source of conductivity, conductive oxides are generally divided into three types: (1) those that conduct electricity through electron (or positive hole) migration; (2) ion conductors that conduct through iron migration; and (3) mixed conductors which combine the action of (1) and (2). Conductive oxides have diverse applications depending on the way their functions are permitted to work. A multiplicity of materials are being researched and developed. It is not possible to cover all these materials. Some properties of a few electromagnetic materials, catalyst materials, and ion conductive materials studied are explained. Applications utilizing their physical properties and functions are outlined by referring to recent literature. Author

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N86-19453 Illinois Inst. of Tech., Chicago.
MECHANICAL PROPERTIES OF DUCTILE ORGANIC FIBER POLYMERIC MATRIX COMPOSITES Ph.D. Thesis
Abraham Mazor 1985 272 p
Avail: Univ. Microfilms Order No. DA8517582

The strengthening and deformational mechanisms of a novel composite made of epoxy resins reinforced with ductile high strength thermoplastic fibers, e.g., PET and Nylon are investigated. The behavior of the uniaxial composite has been studied under static and dynamic loading. A new parameter, Damage Initiation Time (DIT), is defined in this study to denote the composite strain at the onset of failure under impact loading. The effect of constitutent properties (e.g., matrix ductility, fiber type and fiber volume fraction) on composite behavior have been determined. Scanning electron microscopy, radiography, and water absorption methods have been conducted to study the onset of internal damage and failure mechanisms in the composite. Experiments have shown that for composite consisting of a ductile matrix, the composite tensile stress-strain behavior can be predicted by the rule-of-mixtures. The composite fracture is fiber controlled and the composite ductility, under static and dynamic loading, is almost constant and not affected by fiber content. Author

N86-19454 New South Wales Univ., Kensington (Australia). School of Chemical Engineering.
ZIEGLER-NATTA POLYMERIZATION OF BUTADIENE Abstract Only
John Alexander Joseph Honig Feb. 1985 3 p
Avail: Issuing Activity

Butadiene polymerization using a homogeneous Ziegler-Natta catalyst system was studied. Various levels of cobalt octoate, diethylaluminum chloride and water, as well as monomer concentration and reaction temperature were used. The effects of such

changes in reaction conditions upon production of polybutadiene was closely monitored. Conversion, microstructure and molecular weight development were measured. The applicability of prevailing mechanistic hypotheses was assessed, and some of the more common proposals, including chain transfer to monomer or aluminum alkyl, were found to be inappropriate. Chain transfer to cobalt occurred and while catalyst deactivation and chain cleavage were present, they only became apparent at very high conversions. A reaction scheme involving re-use of active centers, combined with termination, is proposed. Author

N86-19455* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METAL PHTHALOCYANINE INTERMEDIATES FOR THE PREPARATION OF POLYMERS Patent
Bappalige N. Achar (National Academy of Sciences/National Research Council, Washington, D.C.), George M. Fohlen (National Academy of Sciences/National Research Council, Washington, D.C.), and John A. Parker (National Academy of Sciences/National Research Council, Washington, D.C.) Issued 11 Jun. 1985 10 p Filed 15 Sep. 1983 Sponsored by NASA Division of US-Patent-Appl-SN-415880, US-Patent-4,456,268, filed 8 Sep. 1982
(NASA-Case-ARC-11405-2; US-Patent-4,522,755;
US-Patent-Appl-SN-514117; US-Patent-Class-260-245.75;
US-Patent-Class-260-245.9; US-Patent-Class-528-327) Avail: US Patent and Trademark Office CSCL 11B

Metal 4, 4', 4'',-tetracarboxylic phthalocyanines (MPTC) are prepared by reaction of trimellitic anhydride, a salt or hydroxide of the desired metal (or the metal in powdered form), urea and a catalyst. A purer form of MPTC is prepared than heretofore. These tetracarboxylic acids are then polymerized by heat to sheet polymers which have superior heat and oxidation resistance. The metal is preferably a divalent metal having an atomic radius close to 1.35A. NASA

N86-19456* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS OF END-CAPPING A POLYIMIDE SYSTEM Patent
Terry L. StClair and Harold D. Burks, inventors (to NASA) Issued 12 Nov. 1985 5 p Filed 11 Sep. 1984
(NASA-Case-LAR-13135-1; US-Patent-4,552,931;
US-Patent-Appl-SN-649328; US-Patent-Class-525-432;
US-Patent-Class-525-436; US-Patent-Class-528-179;
US-Patent-Class-528-182; US-Patent-Class-528-185;
US-Patent-Class-528-352; US-Patent-Class-528-353) Avail: US Patent and Trademark Office CSCL 07D

A process of endcapping a polyimide system with an endcapping agent in order to achieve a controlled decrease in molecular weight and melt viscosity along with predictable fracture resistance of the molded products is disclosed. The uncapped system is formed by combining an equimolar ratio of 4,4'-bis(3,4-dicarboxyphenoxy) diphenylsulfide dianhydride (BDSDA) and 1,-bis(aminophenoxy)benzene (APB) dissolved in bis(2-methoxyethyl)ether. The endcapped system is formed by dissolving APB in bis-(2-methoxyethyl)ether, adding the BDSDA. By varying the amount of endcapping from 0 to 4%, molecular weight is decreased from 13,900 to 8660. At a processing temperature of 250 C, there is a linear relationship between molecular weight and viscosity, with the viscosity decreasing by two orders of magnitude as the molecular weight decreased from 13,900 to 8660. NASA

N86-19457* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE RESISTANT POLYIMIDE FROM TETRA ESTER, DIAMINE, DIESTER AND N-ARYLNADIMIDE Patent
Ruth H. Pater, inventor (to NASA) Issued 24 Dec. 1985 8 p Filed 13 Oct. 1982
(NASA-Case-LEW-13864-1; US-Patent-4,560,742;
US-Patent-Appl-SN-434087; US-Patent-Class-528-342;
US-Patent-Class-528-229; US-Patent-Class-528-322;
US-Patent-Class-528345) Avail: US Patent and Trademark Office CSCL 11B

The invention described relates to improved polyimide resins which are noted for their high thermal and oxidative stability, high strength at elevated temperatures and which exhibit many other outstanding physical and chemical properties, especially useful in high temperature applications. The polyimides are prepared by the reaction, with application of heat of a mixture of monomers comprising: (1) a dialkyl or tetraalkyl ester of an aromatic tetracarboxylic acid, (2) and aromatic diamine, (3) a monoalkyl or dialky ester of a dicarboxylic acid, and (4) a N-arylnadimide such as N-phenylnadimide. Polyimides of monomers (1), (2) and (3) are known. NASA

N86-19458* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION PROTECTION COATINGS FOR POLYMERS Patent
Michael J. Mirtich, James S. Sovey, and Bruce A. Banks, inventors (to NASA) 24 Dec. 1985 6 p Filed 11 Sep. 1984
(NASA-Case-LEW-14072-1; US-Patent-4,560,577;
US-Patent-Appl-SN-649330; US-Patent-Class-427-38;
US-Patent-Class-427-248.1; US-Patent-Class-204/298;
US-Patent-Class-204-192-R; US-Patent-Class-204-192-C;
US-Patent-Class-204-192-D; US-Patent-Class-428-702;
US-Patent-Class-428-473.5; US-Patent-Class-428-446) Avail: US Patent and Trademark Office CSCL 11B

A polymeric substrate is coated with a metal oxide film to provide oxidation protection in low Earth orbital environments. The film contains about 4 volume percent polymer to provide flexibility. A coil of polymer material moves through an ion beam as it is fed between reels. The ion beam first cleans the polymer material surface and then sputters the film material from a target onto this surface. NASA

N86-19459 Harvard Univ., Cambridge, Mass.
EMBRITTLEMENT OF METALLIC GLASSES Ph.D. Thesis
Tsai-Wei Wu 1985 264 p
Avail: Univ. Microfilms Order No. DA8520303

Ductile fracture of metallic glasses is accompanied by extensive local plastic flow. Brittle fracture is promoted by a number of factors: composition, low testing temperature, high strain rate and, most characteristically, annealing (below the crystallization temperature). An extensive study on the embrittlement of amorphous Fe79.3B16.4Si4.0C0.3, including bending tests (both at elevated and low temperatures), tensile tests, fractography, small angle X-ray scattering (SAXS) and differential scanning calorimetry (DSC) is presented. The bending test is ideally suited for determining the ductile-to-brittle transition temperature. The combination of tensile tests and fractography allowed the observation of the ductile-to-brittle transition as a function of strain rate. An isoconfigurational theory was developed for characterizing the kinetics of free volume annihilation during a thermal process. Dissert. Abstr.

N86-19460 State Univ. of New York, Stony Brook.
STRUCTURE AND PROPERTIES OF PLASMA-SPRAYED CERAMIC COATINGS Ph.D. Thesis
Narayansamy Ravi Shankar 1984 302 p
Avail: Univ. Microfilms Order No. DA8513874

Plasma-sprayed ceramic coatings are increasingly being used in a variety of applications. Among these, ZrO2 based thermal barrier coatings (TBC) are often used in applications involving thermal cycling such as in the case of gas turbine engines. Coating failure under these severe conditions is due to factors which include stresses resulting from the thermal expansion mismatch between the ceramic coating and the metallic substrate, residual stresses, adhesion and interfacial reactions, coating composition, and phase transformations. The effects of these factors on the integrity of ZrO2-based and other oxide coatings are examined. Acoustic emission (AE) was used to study a variety of plasma sprayed oxide coatings subjected to thermal cycling in the range 25 to 650 C. Coating adhesion and failure was examined using the tensile adhesion test (TAT) with simultaneous AE monitoring. Contributing to the stresses, during thermal treatment, in the

ZrO2-Y2O3 coatings is the tetragonal-to-monoclinic phase transformation. Dissert. Abstr.

N86-19461*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROCESS FOR PREPARING PHTHALOCYANINE POLYMERS Patent Application
Bappaligе N. Achar (NAS-NRC, Washington, D.C.), George M. Fohlen, and John A. Parker, inventors (to NASA) Filed 12 Jul. 1985 22 p
(NASA-Case-ARC-11511-2; NAS 1.71:ARC-11511-2; US-Patent-Appl-SN-754362) Avail: NTIS HC A02/MF A01 CSCL 11B

Imide-linked bisphthalonitrile compounds are prepared by combining a dicyano aromatic diamine and an organic dianhydride to produce an amic acid linked bisphthalonitrile compound. The amic acid linked bisphthalonitrile compound is dehydrocyclized to produce the imide-linked bisphthalonitrile compounds. The imide-linked bisphthalonitrile compounds may be polymerized to produce a phthalocyanine polymer by heating the imide-linked bisphthalonitrile compound, either alone or in the presence of a metal powder or a metal salt. These compounds are useful in the coating, laminating and molding arts. The polymers are useful in composite matrix resins where increased fire resistance, toughness and resistance to moisture are required, particularly as secondary structures in aircraft and spacecraft. NASA

N86-19462*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLYENAMINES FROM AROMATIC DIACETYLENIC DIKETONES AND DIAMINES Patent Application
Paul M. Hergenrother, Robert G. Bass (Virginia Commonwealth Univ., Richmond), John W. Connell (Virginia Commonwealth Univ., Richmond), and Mark S. Sinsky, inventors (to NASA) (Virginia Commonwealth Univ., Richmond) Filed 15 May 1985 17 p
(NASA-Case-LAR-13444-1-CU; NAS 1.71:LAR-13444-1-CU; US-Patent-Appl-SN-734366) Avail: NTIS HC A02/MF A01 CSCL 11B

The synthesis and characterization of several polyenamine ketones are discussed wherein conjugated diacetylenic diketones and aromatic diamines are used as a route to the formation of high molecular weight polyenamine ketones which exhibit good mechanical properties and can be cast into creasible films. Typical polymerization conditions involved the reaction of stoichiometric amounts of 1,4- or 1,3-PPPO and a diamine at 60 to 130 C in M-cresol at (w/w) solids content of 8 to 26% for a specified period of time under a nitrogen atmosphere. Novel polyenamine ketones were prepared with inherent viscosities as high as 1.99 d1/g and tough, clear amber films with tensile strengths of 12,400 psi and tensile moduli of 397,000 psi were cast from solutions of the polymers in chloroform. In most cases, the elemental analyses for the polynamine ketones, shown, agree within + or - 0.3% of the theoretical values. NASA

N86-19463*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION PROTECTING COATINGS FOR POLYMERS Patent Application
Michael J. Mirtich, James S. Sovey, and Bruce A. Banks, inventors (to NASA) Filed 31 Jul. 1985 11 p
(NASA-Case-LEW-14072-2; NAS 1.71:LEW-14072-2; US-Patent-Appl-SN-761235) Avail: NTIS HC A02/MF A01 CSCL 11B

A polymeric substrate is coated with a metal oxide film to provide oxidation protection in low Earth orbital environments. The film contains about 4 volume percent polymer to provide flexibility. A coil of polymer material moves through an ion beam as it is fed between reels. The ion beam first cleans the polymer material surface and then sputters the film material from a target onto this surface. NASA

N86-19464*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Civil Engineering.
ANALYSIS OF THE TRANSIENT BEHAVIOR OF RUBBING COMPONENTS Final Report
Mongi Ben Quezdou and R. L. Mullen 19 Feb. 1986 51 p refs (Grant NAG3-369)
(NASA-CR-176546; NAS 1.26:176546) Avail: NTIS HC A04/MF A01 CSCL 11G

Finite element equations are developed for studying deformations and temperatures resulting from frictional heating in sliding system. The formulation is done for linear steady state motion in two dimensions. The equations include the effect of the velocity on the moving components. This gives spurious oscillations in their solutions by Galerkin finite element methods. A method called streamline upwind scheme is used to try to deal with this deficiency. The finite element program is then used to investigate the friction of heating in gas path seal. Author

N86-19465*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOW TO EVALUATE SOLID LUBRICANT FILMS USING A PIN-ON-DISK TRIBOMETER
Robert L. Fusaro 1986 22 p refs Proposed for presentation at the 1986 Annual Meeting of the American Society of Lubrication Engineers, Toronto, Ontario, 12-15 May 1986
(NASA-TM-87236; E-2909; NAS 1.15:87236) Avail: NTIS HC A02/MF A01 CSCL 11/4

Over the years, the author has evaluated and compared hundreds of solid lubricant films using a pin-on-disk tribometer. The intent of this paper is to describe to the reader experimental techniques and some of parameters that have been observed to be important for the evaluation and development of new solid lubricant films. Pin-on-disk tribometers will be described and discussed as will experimental methods for evaluating solid lubricant materials. Methods of preparing surfaces for the coating of the thin films and different methods for applying the films will be reviewed. Factors that affect solid lubricant performance will also be discussed. Two different macroscopic mechanisms of solid lubricant film wear exist. These will be characterized schematically, and methods of measuring wear will be examined. Author

N86-19466# Texas A&M Univ., College Station. Dept. of Chemistry.
ELECTRONICALLY CONDUCTIVE COMPOSITE POLYMER MEMBRANES
R. M. Penner and C. R. Martin 20 Sep. 1985 31 p
(Contract N00014-82-K-0612)
(AD-A159708; TR-10) Avail: NTIS HC A03/MF A01 CSCL 11/9

We have recently described the preparation and properties of ionically conductive Nafion-impregnated Gore-tex (NIGT) composite membranes. In this paper we describe electronically conductive composite membranes prepared by electropolymerizing either pyrrole or thiophene within the ionically conductive NIGT membrane. These composites have the mechanical properties of the host membrane yet the electronic conductivity of the NIGT/polypyrrole composite membrane is essentially identical to that of polypyrrole. For comparison, we have also attempted to electropolymerize pyrrole in nafion membranes and films and in bare Gore-tex and poly(vinyl chloride)-impregnated Gore-tex. We have found that the rate of polymerization of pyrrole at a NIGT-coated Pt electrode is higher than the rate at bare Pt. The origins of this rate enhancement are probed. GRA

N86-19467# Texas Univ., Austin. Dept. of Chemistry.
A SIMS STUDY OF THE INFLUENCE OF LOW LEVELS OF SILICON AND CALCIUM ON THE ADSORPTION PROPERTIES OF O2 ON Pt(111) Technical Report, 1 Jan. - 31 Dec. 1985
S. Akhter, C. M. Greenlief, H.-W. Chen, and J. M. White 15 Oct. 1985 17 p Submitted for publication
(Contract N00014-83-K-0582)
(AD-A160699; TR-43) Avail: NTIS HC A02/MF A01 CSCL 07/4

Surface impurity levels of Calcium, Silicon and Aluminum at or below the detectability limits of AES were followed in SIMS and

correlated with oxygen adsorption on Pt (111). It is shown that oxidation of Silicon to Si0x, monitored by the rise in SIMS Si+ ion intensity, takes place above 5400K during oxygen TPD. SiOx starts decomposing above 1100K and can be reduced within 200 sec by 2x10 to the minus 8th power torr of H2 at 1200K. The oxygen adsorbed/desorbed in a TPD cycle depends on the immediate history of the impurity levels on the surface. SiOx presence correlates with an increase in the overall oxygen sticking coefficient. These results highlight the importance of impurity levels below AES detectability and suggest pretreatment methods for obtaining better reproducibility. GRA

N86-19468# State Univ. of New York at Buffalo, Amherst. Dept. of Chemistry.
MOLECULAR MECHANICS OF POLYMERIC INTERACTIONS Final Report, 15 Feb. 1982 - 14 Feb. 1985
Paras N. Prasad Feb. 1985 9 p
(Grant AF-AFOSR-0118-82)
(AD-A161095; AFOSR-85-0917TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

Three interfacial methods have been used to produce thin polymeric films. These are reactions at solid-gas interface, Langmuir-Blodgett, and electrochemical polymerization. The reaction at solid-gas interface involved the use of a thin monomeric film, vacuum deposited, which was subsequently exposed to a strong Lewis acid such as AsF5 in a controlled atmosphere. Two new polymers were produced: polyfuril and polyazulene. Coherent thin films of poly bis(p-toluene sulfonate) diacetylene were successfully formed by modified Langmuir-Blodgett techniques using two methods: photopolymerization of the monomer film at the gas/liquid interface and then transfer to a solid substrate; and transfer of the monomer film to the solid substrate and subsequent photopolymerization on the substrate itself. The area of polymerization of the electrode/solution interface in an electrochemical cell is highly active because of the prospect to produce high quality electroactive polymers of controlled ultrasubmicron thickness. Polyazulene was formed by anodic polymerization of azulene. Chemical doping will increase the electrical conductivities of several polymers as well as induce conformational changes in some polymers. The nature of the iodine-nylon 6 complex was by resonance Raman spectroscopy. This work revealed the presence of both I3 minus and I5 minus species. The non-linear electroacoustic effect in organic materials was investigated by the novel technique of phonon echo. The phonon echo was investigated for the d-tartaric acid and its diammonium salt as well as for the Rochelle salt by using the two-pulse technique. GRA

N86-19469# Hughes Research Labs., Malibu, Calif.
FABRICATION OF LOW-LOSS HALIDE GLASS FIBERS Final Report, 1 Jun. 1983 - 30 Sep. 1984
J. Wysocki Sep. 1985 28 p
(AD-A161111) Avail: NTIS HC A03/MF A01 CSCL 11/2

The primary objective of this program was to develop ultralow-loss fibers for use in long-distance Navy communications systems. Materials that would transmit in the infrared, as well as fiber drawing processes for these materials. Major emphasis has been placed on fabrication of chloride and fluoride-chloride glasses. These glasses were subsequently doped with a sulfide. Heavy-metal fluoride glasses, which are generally considered to be viable for IR fiber fabrication, are being prepared. For the present program, two different compositions of CdF2-CdCl2-BaF2 were prepared and subsequently doped with either CdS or ZnS. Impure starting materials, devitrification, and steep viscosity curves combined to limit fiber fabrication. Continuation of research aimed at the growth of single crystal KRS-5 fibers is also discussed. By using single-crystal fibers, both the intrinsic predicted low loss of this material and a reduction in the aging process of fibers extruded from the material were anticipated. GRA

N86-19470# Princeton Univ., N. J. Dept. of Chemical Engineering.
HYDROGEN BONDING IN POLYURETHANES: PRELIMINARY RESULTS OF SIMULTANEOUS DSC-FTIR (DIFFERENTIAL SCANNING CALORIMETER-FOURIER TRANSFORM INFRARED SPECTROSCOPY) EXPERIMENTS
Jeffrey T. Koberstein, Irene Gancarz, and Thomas C. Clarke 11 Nov. 1985 27 p
(Contract N00014-84-K-0534)
(AD-A161223; TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/3

The hydrogen bonding behavior of segmented polyurethane elastomers and model hard segment compounds has been examined by performing simultaneous differential scanning calorimeter (DSC) and Fourier Transform Infrared Spectroscopy (FTIR) measurements. In model hard segments of 4,4'-diphenylmethane diisocyanate (MDI) extended with (2,2,3,3-d4) butanediol (BDO), and 2,4-toluenediisocyanate also chain extended with BDO, the spectra show a linear decrease in the apparent degree of hydrogen bonding over most of the temperature range. In the case of MDI-BDO, there is thus no clear correlation between DSC multiple endotherms and the degree of hydrogen bonding. Examination of an elastomer containing 70% bwt. of MDI/BDO hard segment and polyether soft segment however reveals a transition in the degree of hydrogen bonding coincident with an endotherm whose origin has been previously ascribed to the onset of a microphase mixing transition. This result clearly demonstrates that thermally induced morphological changes can affect markedly the hydrogen bonding behavior of polyurethanes. The study also illustrates that chemical changes occur during a typical DSC thermogram. In particular, reversal of the polyurethane reaction equilibrium is evidenced by emergence of an isocyanate absorbance band at high temperatures for all materials. GRA

N86-19471# FilmTec Corp., Minneapolis, Minn.
NONFOULING COATINGS FOR THIN FILM COMPOSITE MEMBRANES Final Report
J. Y. Koo, J. M. Reitz, J. E. Cadotte, and R. J. Petersen Mar. 1985 107 p
(Grant DI-14-08-0001-22888)
(PB85-247971) Avail: NTIS HC A06/MF A01 CSCL 07A

Polymers containing sulfonate groups were synthesized and evaluated as fouling-resistant coatings for reverse osmosis membranes. The Film Tec FT-30 membrane was used as the substrate. Best results were obtained with a coating of poly(sodium stryene-sulfonate-co-chloromethyl-styrene) crosslinked with an acid catalyst. In laboratory tests with feedwaters containing tannic acid, this coating showed much lower fouling rates compared with uncoated FT-30 controls. However, initial membrane fluxes were also lowered considerably just by the act of applying this coating, so that comparative fluxes of the final fouled membranes were not particularly different. For example, using a standardized test condition (200 psi, 25C, 0.2 percent sodium chloride feed containing 500 ppm tannic acid, pH 7 adjusted with phosphoric acid, 18 hour test), uncoated FT-30 controls exhibited a typical initial flux of 15 gfd and final flux of 5.5 gfd; coated membranes showed a typical initial flux of 11 gfd and a final flux of 6.0 gfd. GRA

N86-19450# Joint Publications Research Service, Arlington, Va.
DEVELOPING ABRASION-RESISTANT CERAMICS
Tadahiko Watanabe *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 33-41 Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 45-49 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

N86-19487# Joint Publications Research Service, Arlington, Va.
CERAMICS STRATEGY OF ASAHI GLASS REPORTED
A. Araki *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 24-28 Transl. into ENGLISH from Nikko Material (Tokyo, Japan), Apr. 1985 p 12-15 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N86-19472# National Aerospace Lab., Tokyo (Japan). HMX Propellant Research Group.

THE FUNDAMENTAL STUDY OF HMX COMPOSITE PROPELLANT AND ITS PRACTICAL APPLICATION

Sep. 1985 58 p refs In JAPANESE; ENGLISH summary
(NAL-TR-875; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

Synthetic research on HMX composite propellants is described, from the fundamental investigation of propellant burning mechanisms to the demonstration firing test of a full-scale apogee motor. First, the safety and physical properties were examined. By using a new bonding-agent between HMX and HTPB binder for HMX composite propellants, detonability was held in the same manner as the standard propellant without HMX, and some mechanical properties were improved. Second, burning experiments of various HMX/binder strands were made and from these results the mechanism of lowering the burning rate of HMX composite propellants was discussed. Third firing tests of small-scale rocket motors were conducted under the atmospheric condition for obtaining fundamental combustion characteristics. An example of these characteristics is the absence of combustion instability. Finally, a full-scale (76mm dia.) spherical motor was tested by means of the high altitude test facility. The specific impulse under the vacuum condition was 2.90KN.s/kg(296kgf.s/kg) at a nozzle expansion ratio of 70. Author

N86-19473# Southwest Research Inst., San Antonio, Tex. Belvoir Fuels and Lubricants Research Facility.

STUDY OF FUEL DETERIORATION AND ADDITIVE-INHIBITION Interim Report, 1 Oct. 1983 - 30 Sep. 1984

George H. Lee, III and Leo L. Stavinoha Jul. 1985 40 p
(Contract DAAK70-85-C-0007)
(AD-A161173; BFLRF-193) Avail: NTIS HC A03/MF A01 CSCL 21/4

This interim report summarizes research in support of defining distillate fuel deterioration and additive inhibition. Primary text emphasis is placed on data generated during FY84 involving adherent insolubles, peroxide number, bromine number, and elemental analysis for fuels aged under accelerated conditions. A series of 18 experiments using 3 fuels and 4 additives are reported with primary emphasis on a reference diesel fuel used for engine tests. Observations discussed in the report are summarized as conclusions and recommendations for FY85 ongoing research. GRA

N86-19474# Naval Postgraduate School, Monterey, Calif.

COMPUTER-CONTROLLED IMAGE ANALYSIS OF SOLID PROPELLANT COMBUSTION HOLOGRAMS USING A QUANTIMET 720 AND A PDP-11 M.S. Thesis

Marvin P. Shook Sep. 1985 149 p
(AD-A161212) Avail: NTIS HC A07/MF A01 CSCL 21/2

This thesis describes the implementation of a computer-controlled image analyzer to obtain particle size information from holograms of rocket engine combustion products. The two machines utilized were a Quantimet 720 Image Analyser and a DEC PDP-11 digital computer. The machines are described in terms or their hardware, software, and interface. Preliminary results are included and indicate that the present system is incapable of obtaining the desired particle information from a hologram. The causes for this, as well as their resolution are discussed. Author (GRA)

N86-19475# Ballistic Research Labs., Aberdeen Proving Ground, Md.

CLOSED CHAMBER BURNING CHARACTERISTICS OF NEW VHBR (VERY HIGH BURNING RATE) FORMULATIONS Memorandum Report, Jan. - Sep. 1984

Kevin J. White, Donald G. McCoy, J. O. Doali, William P. Aungst, and Roger E. Bowman Oct. 1985 41 p
(DA Proj. 1L1-61102-AH-43)
(AD-A161250; BRL-MR-3471) Avail: NTIS HC A03/MF A01 CSCL 21/2

Combustion studies were carried out on VHBR propellants in order to determine formulation and fabrication parameters that control the burning characteristics of these compounds. Formulation parameters such as type of fuel, oxidizer, type and percent of binder, oxidizer/binder ration and percent of theoretical maximum density were varied and the effects on combustion were studied using both a closed chamber and an optically transparent bomb. Although numerous facets of the combustion mechanisms remain unclear, the following picture has emerged for the specific formulations studied. The first phase of combustion is a relatively slow porous burning that proceeds down throughout the sample. The original form of the sample remains, although the residue is porous and is filled with hot combustion products. Depending on the composition, percent theoretical density and sample confinement, a transition to a very rapid combustion takes place throughout the entire sample, accompanied by some deconsolidation. For some conditions (composition or confinement) this second phase does not occur. The transition pressure to and the velocity of the second phase varies with the formulation parameters. GRA

N86-19476# Institut Franco-Allemand de Recherches, St. Louis (France).

STUDIES OF THE COMBUSTION OF SOLID PROPELLANTS UP TO 1000 MPa

D. Grune 13 Feb. 1985 24 p Presented at 1st Meeting for Information Exchange on Internal Ballistic Research, Weil am Rhein, West Germany, 22-25 May 1985
(ISL-CO-201/85) Avail: NTIS HC A02/MF A01

Solid propellant burning at pressures of 600 MPa and higher was investigated using a high pressure vessel designed to carry out burning rate measurements. Higher pressures are desirable to improve gun design. The high pressure bomb has a 400cc chamber and can withstand pressures of over 1000 MPa. Equations of state were calculated using an Abel equation obtained by fitting the measurements up to 450 MPa and using a 3 term Virial equation with coefficients obtained from measurements of up to 450 MPa pressure. The differences observed strongly depend on the type of propellant, and better fits are obtained using the Virial equation. At loading densities $>$ 0.44 g/cc a considerable change in burning behavior is observed. Maximum deviation from theoretical data is found at 400 MPa. Author (ESA)

N86-19477# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Dept. de Petroleo y Materiales Functionales y Protectivos.

UTILIZATION OF LIQUIFIED PETROLEUM GAS (LPG) IN COMPRESSION IGNITED MOTORS [UTILIZACION DE GASES LICUADOS DEL PETROLEO (GLP) A MOTORES DE COMPRESION IGNICION]

Jose Estaire Alonso 1985 11 p refs In SPANISH
Avail: NTIS HC A02/MF A01

Performance tests were carried out on a commercial diesel motor. Several gas compositions were tried, including 97% C3, 32% propane, 68% butane, and mixed olefines with 45% olefins. The motor is a Pagaso with 11,945 cc and 148 kW power. The results show that only slight mechanical modifications are necessary and that no significant power variation are related to changes in fuel composition. Smell, smoke, and pollutants are greatly reduce by the utilization of the liquified gas. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N86-19478 New South Wales Univ., Kensington (Australia).

[DESIGN USE AND CONSTRUCTION OF STRESSED SKIN

INSULATING PANEL STRUCTURES WITH SPECIAL REGARD TO THEIR USE WITH COLD STORAGE CONTROLLED ENVIRONMENTS] Abstract Only
J. C. Wanty Mar. 1985 3 p
Avail: Issuing Activity

The techniques currently employed in the design use and construction of stressed skin insulating panel structures are studied, with particular reference to cold stores and freezers, utilizing steel sheathed polystyrene panels. Author

N86-19479* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SEQUENTIALLY DEPLOYABLE MANEUVERABLE TETRAHEDRAL BEAM Patent
Martin M. Mikulas, Jr. (General Research Corp., Santa Barbara, Calif.) and Robert F. Crawford, inventors (to NASA) (General Research Corp., Santa Barbara, Calif.) Issued 10 Dec. 1985 9 p Filed 8 Sep. 1983 Sponsored by NASA
(NASA-Case-LAR-13098-1; US-Patent-4,557,097; US-Patent-Appl-SN-530339; US-Patent-Class-52-646; US-Patent-Class-52-632; US-Patent-Class-52-637; US-Patent-Class-52-648; US-Patent-Class-16-242; US-Patent-Class-16-390; US-Patent-Class-403-64; US-Patent-Class-403-171) Avail: US Patent and Trademark Office CSCL 20K

A tetrahedral beam that can be compactly stowed, sequentially deployed, and widely manipulated to provide a structurally sound yet highly maneuverable truss structure is comprised of a number of repeating units of tandem tetralhedral sharing common sides. Fixed length battens are jointed into equilateral triangles called batten frames. Apexes of adjacent triangles are interconnected by longerons having a mid-point folding hinge. Joints, comprised of gussets pivotabley connected by links, permit two independent degrees of rotational freedom between joined adjacent batten frames, and provide a stable structure from packaged configuration to complete deployment. The longerons and joints can be actuated in any sequence, independently of one another. The beam is suited to remote actuation. Longerons may be provided with powered mid-point hinges enabling beam erection and packaging under remote control. Providing one or more longerons with powered telescoping segments permits the shape of the beam central axis to be remotely manipulated so that the beam may function as a remote manipulator arm.
Official Gazette of the U.S. Patent and Trademark Office

N86-19480# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
ASET-B: A ROOM FIRE PROGRAM FOR PERSONAL COMPUTERS
William D. Walton Dec. 1985 41 p refs Sponsored in part by National Park Service, Washington, D.C. and Department of Health and Human Services, Washington, D.C.
(NBSIR-85-3144-1) Avail: NTIS HC A03/MF A01

ASET-B, a personal computer program for predicting the fire environment in a single room, is presented. ASET-B solves the same differential equations as the previously developed computer program, ASET (Available Safe Egress Time), using a simpler numerical technique. ASET-B requires as input the height and area of the room, the elevation of the fire above the floor, a heat loss factor, and a fire specified in terms of heat release rate. The program predicts the thickness and the temperature of the hot smoke layer as a function of time. ASET-B is written in BASIC and is not subject to copyright. The program and its use are described. Included are a listing of the program, program variable name listing and a sample run. A discussion of user modifications also is given. Author

N86-19481# National Bureau of Standards, Gaithersburg, Md. Center for Fire Research.
USER'S GUIDE FOR FAST
William D. Walton, Steven R. Baer, and Walter W. Jones Dec. 1985 35 p refs
(NBSIT-85-3284) Avail: NTIS HC A03/MF A01

FAST is a multicompartment zone type computer model which predicts the smoke hazard development in each compartment based on a description of the compartments and the fire. A FORTRAN program has been written for the model. This user's guide provides a detailed description of the data input requirements and the output produced by version 17 of the program. Also included are sample program input and output. Author

N86-19482# Naval Civil Engineering Lab., Port Hueneme, Calif.
DEVELOPMENT OF A SELF-TUNING CONTROLLER FOR HVAC (HEATING, VENTILATING, AND AIR CONDITIONING) SYSTEMS Final Report, Oct. 1982 - Nov. 1984
R. E. Kirts and I. L. Chien Aug. 1985 41 p
(DA Proj. Z03-71)
(AD-A160328; NCEL-TN-1731) Avail: NTIS HC A03/MF A01 CSCL 13/1

A self-tuning control algorithm suitable for application to many processes, including those of heating, ventilating, and air conditioning, was developed and tested. Initial experimental evaluation indicates that the controller may be applicable to a variety of common HVAC processes. Self-tuning controls can improve process efficiency and reduce maintenance. GRA

N86-19483# Stan and Associates, Inc., Dayton, Ohio.
UNDERSTANDING HVAC (HEATING, VENTILATING AND AIR CONDITIONING) CONTROLS FOR BETTER ENERGY EFFICIENCY
R. Stan, S. Tuma, and J. Harms 1985 109 p
(PB85-247518; ENR/BE-85/01) Avail: NTIS HC A06/MF A01 CSCL 13A

The manual provides a reference on heating, ventilating and air conditioning (HVAC) systems and controls, and gives an understanding of how existing systems controls work and can be operated to enhance their energy efficiency. The text also covers how new systems can be selected to minimize energy use. The eighth chapter manual covers the topics of basic control systems, psychrometrics, basic HVAC configurations, control strategies, pneumatic control operation, electronic controls and their calibration and energy conservation opportunity (ECO) retrofits for increased efficiency. Author

N86-19484# Joint Publications Research Service, Arlington, Va.
JAPAN REPORT: SCIENCE AND TECHNOLOGY
27 Jan. 1986 122 p refs Transl. into ENGLISH from various Japanese articles
(JPRS-JST-86-002) Avail: NTIS HC A06/MF A01

Areas of discussion in this issue of Japanese science and technology include electronics, energy, new materials, basic technology research, and transportation. Some article titles include: (1) Moonlight project promotes energy saving technology; (2) Production, application of piezoelectric ceramics described; (3) Capitilizing on available information; and (4) Reasons for automobile export restrictions explained. For individual titles, see N86-19485 through N86-19489.

N86-19485# Joint Publications Research Service, Arlington, Va.
MOONLIGHT PROJECT PROMOTES ENERGY-SAVING TECHNOLOGY c44
Akira Ishihara *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 8-15 Transl. into ENGLISH from Denki To Gasu (Tokyo, Japan), Jun. 1985 p 17-21 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

In promoting energy saving, development of energy conservation technologies aimed at raising energy efficiency in the fields of energy conversion, its transportation, its storage, and its consumption is considered, along with enactment of legal actions urging rational use of energies and implementation of an enlightenment campaign for energy conservation to play a crucial role. Under the Moonlight Project, technical development is at present

being centered around the following six pillars: (1) large scale energy saving technology; (2) pioneering and fundamental energy saving technology; (3) international cooperative research project; (4) research and survey of energy saving technology; (5) energy saving technology development by private industry; and (6) promotion of energy saving through standardization. Heat pumps, magnetohydrodynamic generators and fuel cells are discussed. Author

N86-19486# Joint Publications Research Service, Arlington, Va.
PRODUCTION, APPLICATION OF PIEZOELECTRIC CERAMICS DESCRIBED c33
Jiro Inoue *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 16-23 refs Transl. into ENGLISH from Nikko Materials (Tokyo, Japan), Apr. 1985 p 1-4 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

Besides ceramics, piezoelectric materials include single crystals such as quartz, thin film such as zinc oxide, and high polymers such as polyvinylidene fluoride. Among these, lead zirconium titanate and other piezoelectric ceramics, as well as quartz, are most often used. This is because piezoelectric ceramics have the following characteristics: (1) can be moded into the desired size and form; (2) excellent in mass productivity and low in cost; (3) have large k, electric mechanical coupling constant, making it possible to control mechanical Q (Qm) and epsilon; and (4) have good temperature property and chronological stability. The production method and various applications of piezoelectric ceramics are outlined. Author

N86-19487# Joint Publications Research Service, Arlington, Va.
CERAMICS STRATEGY OF ASAHI GLASS REPORTED c27
A. Araki *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 24-28 Transl. into ENGLISH from Nikko Material (Tokyo, Japan), Apr. 1985 p 12-15 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

Progress in nonpressure sintering method first utilized in 1980, as contrasted to the conventional sintering/baking hot press method where baking and hardening are done under external physical pressure is presented. This new method, as indicated by its name, bakes and hardens without adding pressure and has made it possible to mass produce products of complex form or large size for which the hot press method is not suitable. Following this development, high purity particulate crystals of silicon nitrite based on Chemical Vapor Deposition was developed to refine the raw material powder. Other materials and processes are discussed. Author

N86-19488# Joint Publications Research Service, Arlington, Va.
CAPITALIZING ON AVAILABLE INFORMATION c60
Jiro Hiraishi *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 63-70 Transl. into ENGLISH from Kogyo Gijutsu (Tokyo, Japan), Jun. 1985 p 30-35 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

Where research of chemical technology is concerned, needs for data bases are very intense because of the multiple characteristics of diverse substances to be handled. Of the data bases, fact data bases are presently the focus of concern in the relevant sector, along with the CAD systems. Building up of data bases is strived for in connection with such fact data bases as the structure of molecules, thermochemical and thermodynamic properties, properties related to chemical engineering including viscosity, and safety or toxicity of substances. Spectral data, meanwhile, has played the role of the pioneer in the activity of building up the fact data base; the reason is that the spectral data has served greatly in the analysis of chemical structure and qualitative and quantitative analysis of organic compounds and that putting in order the spectral data for many of the compounds has been needed in the course of development of petroleum chemistry. The data build-up activity for spectral data has a long history and for infrared spectral data, in particular. The build up of a spectral data base system is discussed. Author

N86-19489# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF FINE CERAMICS
In its Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 85-91 Transl. into ENGLISH from Kogyo Gijutsu (Tokyo, Japan), Jun. 1985 p 42-45 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

New materials are apparently still in initial stages of development and technologically immature in many aspects. They involve many problems to be solved if they are to develop in future. This is due to the fact that the development of new materials, and particularly those for structural materials, absolutely requires building up knowledge of the relevant basic research to be carried out over long years, and building up reliable data, not just an improvement on existing technologies. Testing and assessment which is indispensable in securing reliable data, with fine ceramics being used as the example is discussed. Author

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N86-19490 Ohio State Univ., Columbus.
PERFORMANCE OF RESONANT RADAR TARGET IDENTIFICATION ALGORITHMS USING INTRA-CLASS WEIGHTING FUNCTIONS Ph.D. Thesis
Ahmad Mustafa 1985 226 p
Avail: Univ. Microfilms Order No. DA8518995

The use of calibrated resonant-region radar cross section (RCS) measurements of targets for the classification of large aircraft is discussed. Errors in the RCS estimate of full scale aircraft flying over an ocean, introduced by the ionospheric variability and the sea conditions were studied. The Weighted Target Representative (WTR) classification algorithm was developed, implemented, tested and compared with the nearest neighbor (NN) algorithm. The WTR-algorithm has a low sensitivity to the uncertainty in the aspect angle of the unknown target returns. In addition, this algorithm was based on the development of a new catalog of representative data which reduces the storage requirements and increases the computational efficiency of the classification system compared to the NN-algorithm. Experiments were designed to study and evaluate the characteristics of the WTR- and the NN-algorithms, investigate the classifiability of targets and study the relative behavior of the number of misclassifications as a function of the target backscatter features. The classification results and statistics were shown in the form of performance curves, performance tables and confusion tables. Author

N86-19491 British Broadcasting Corp., Kingswood (England). Engineering Div.
DBS PAY TELEVISION: PICTURE SIGNAL SCRAMBLING
M. J. Knee Oct. 1985 16 p refs
(BBC-RD-1985/12) Avail: Issuing Activity

Picture signal scrambling methods suitable for a direct broadcast by satellite DBS MAC pay television channel are described. They use a technique known as rotation scrambling, which is shown to meet the likely requirements for picture quality, security against piracy, scrambling effectiveness and cost. The methods have been tested using experimental equipment and the results have led to an agreement within the EBU to incorporate them into the MAC specification. E.A.K.

N86-19492 New Mexico State Univ., Las Cruces.
SCATTERING AND ATTENUATION OF MILLIMETER WAVELENGTH RADIATION BY SNOW Ph.D. Thesis

1985 138 p
Avail: Univ. Microfilms Order No. DA8519958

A finite element computer model for single particle scattering is applied to the problem of scattering and absorption of polarized millimeter wave (MMW) radiation by individual dry snowflakes. Several snow crystal shapes are examined at broadside and edge on orientations relative to the direction of incidence of the MMW plane wave. Equivalence of the scattering characteristics of the snow crystals with those of solids of revolution is approximated through the use of well known effective refractive index mixing rules. The accuracy of the equivalence criteria is also discussed. Monodispersions of randomly distributed snowflakes of identical shape and orientation are first studied, and a damped periodic oscillation of the polarized transmitted intensities with distance is predicted. Random orientation effects in snowflake monodispersions are also examined with the propagation theory employed here. The effect of crystal shape upon the forward-propagating MMW radiation in oriented monodispersions with identical number densities is displayed. Dissert. Abstr.

N86-19493*# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
ENGINEERING CALCULATIONS FOR COMMUNICATIONS SATELLITE SYSTEMS PLANNING Interim Report, 16 Jul. 1984 - 15 Jul. 1985
C. H. Reilly, C. A. Levis, C. Mount-Campbell, D. J. Gonsalvez, C. W. Wang, and Y. Yamamura 1985 46 p refs
(Grant NAG3-159)
(NASA-CR-176555; NAS 1.26:176555; Rept-716548-2) Avail: NTIS HC A03/MF A01 CSCL 17B

Computer-based techniques for optimizing communications-satellite orbit and frequency assignments are discussed. A gradient-search code was tested against a BSS scenario derived from the RARC-83 data. Improvement was obtained, but each iteration requires about 50 minutes of IBM-3081 CPU time. Gradient-search experiments on a small FSS test problem, consisting of a single service area served by 8 satellites, showed quickest convergence when the satellites were all initially placed near the center of the available orbital arc with moderate spacing. A transformation technique is proposed for investigating the surface topography of the objective function used in the gradient-search method. A new synthesis approach is based on transforming single-entry interference constraints into corresponding constraints on satellite spacings. These constraints are used with linear objective functions to formulate the co-channel orbital assignment task as a linear-programming (LP) problem or mixed integer programming (MIP) problem. Globally optimal solutions are always found with the MIP problems, but not necessarily with the LP problems. The MIP solutions can be used to evaluate the quality of the LP solutions. The initial results are very encouraging. Author

N86-19494*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADIOFREQUENCY TESTING OF SATELLITE SEGMENT OF SIMULATED 30/20 GHz SATELLITE COMMUNICATIONS SYSTEM
Regis F. Leonard and Robert Kerczewski (Analex Corp., Cleveland, Ohio) Nov. 1985 26 p refs
(NASA-TM-87163; E-2797; NAS 1.15:87163) Avail: NTIS HC A03/MF A01 CSCL 17B

A laboratory communications system has been developed that can serve as a test bed for the evaluation of advanced microwave (30/20 GHz) components produced under NASA technology programs. The system will ultimately permit the transmission of a stream of high-rate (220 Mbps) digital data from the originating user, through a ground terminal, through a hardware-simulated satellite, to a receiving ground station, to the receiving user. This report contains the results of radiofrequency testing of the satellite portion of that system. Data presented include output spurious responses, attainable signal-to-noise ratios, a baseline power budget, usable frequency bands, phase and amplitude response data for each of the frequency bands, and the effects of power level variation. Author

N86-19495# JAYCOR, San Diego, Calif.
CONCEPTS FOR NEAR CONTINUOUS RECEPTION OF VHF (VERY HIGH FREQUENCY) SIGNALS USING METEOR BURST PROPAGATION Final Technical Report, 18 Sep. 1984 - 17 May 1985
F. Felber, H. Davis, R. Stahl, R. Wheeler, and D. Wright 15 Jul. 1985 103 p
(Contract N00014-84-C-0730)
(AD-A159891; JAYCOR-J200-85-875/2393) Avail: NTIS HC A06/MF A01 CSCL 17/2

The objective of this program, as given in the original JAYCOR proposal, has been to design experiments leading to the verification of diversity reception techniques for tactical C2 signal collection. The results of this design effort are summarized in this final report. The experimental program that has been designed is referred to in this report as the VHF Reception Program -- Phase 2. Similarly, the program that has just been completed is referred to as the Phase 1 program. In the Phase 1 program, we have identified three key physics issues concerning diversity reception of meteor path propagation. These issues are: What is the gain vs. beamwidth tradeoff on a single receiver antenna? Can independent meteor propagation paths be obtained at a single location using multiple receiver antennas? and What spatial separation is needed to obtain independent paths from a common volume? GRA

N86-19496# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.
EXACT PERFORMANCE ANALYSIS OF THE CENSORED MEAN-LEVEL DETECTOR IN A MULTIPLE-TARGET ENVIRONMENT
J. A. Ritcey 15 Jul. 1985 34 p
(Grant AF-AFOSR-0343-82)
(AD-A160349; AFOSR-85-0752TR) Avail: NTIS HC A03/MF A01 CSCL 17/9

The censored mean-level detector (CMLD) is an alternative to the mean-level detector that achieves robust detection performance in a multiple-target environment by censoring several of the largest samples of the maximum-likelihood estimate of the background noise level. Here we derive exact expressions for the probability of detection of he CMLD in a multiple-target environment when a fixed number of Swerling II targets are present. The primary target is modelled by Swerling case II, and only single-pulse processing is analyzed. Optimization of the CMLD parameters is considered, and a comparison to other detectors is presented. GRA

N86-19497# Naval Postgraduate School, Monterey, Calif.
TROPO: A MICROCOMPUTER BASED TROPOSCATTER COMMUNICATIONS SYSTEM DESIGN PROGRAM M.S. Thesis
E. M. Siomacco Sep. 1985 162 p
(AD-A160877) Avail: NTIS HC A08/MF A01 CSCL 17/2

This thesis presents a microcomputer based, computer-aided design program for tactical military tropospheric scatter radio systems. The program has the capability of predicting the system performance and reliability for both analog (FM/FDM) and digital troposcatter radiolinks for both analog (FM/FDM) and digital tropospheric ducting. A height gain computational model for specific elevated tropospheric ducts is derived from statistical radiosonde data. A terrain profile plot, real time radiosonde data analysis, and the probability of error for digital radiolinks are provided as program options. GRA

N86-19498# Delta Information Systems, Inc., Horsham, Pa.
DEVELOPMENT OF A METHODOLOGY TO TEST VIDEO CODECS USED IN TELECONFERENCING Final Technical Information Bulletin
23 Aug. 1985 53 p
(Contract DCA100-83-C-0047)
(AD-A160878; NCS-TIB-85-1) Avail: NTIS HC A04/MF A01 CSCL 17/2

The purpose of this report is to define a test methodology for the evaluation of motion television codecs for teleconferencing applications. The results of this evaluation will serve as a guideline for the future preparation of specifications for codecs of this type.

The principle characteristics of the codecs include the following: (1) utilize digital communication channels, (2) operate at a data rate of 1.544 Mbps, (3) provide color capability, and (4) provide motion capability. The specific objective of the tests describes is to rank the codecs tested in order of performance. The reason that new tests are being developed is that there are presently no agreed upon test procedures for that purpose. The tests described will utilize a specifically prepared video tape containing still and motion sequences designed specifically for the evaluation of this type of codec. These sequences will be passed through the codecs and the output recorded on video tape. The evaluation and grading of each codec will be on a subjective, comparative basis. GRA

N86-19499# Pacific-Sierra Research Corp., Los Angeles, Calif.
LOCALIZED ELF PROPAGATION ANOMALIES Final Technical Report, Mar. - Dec. 1984
E. C. Field, Jr. and C. R. Warber Jun. 1985 60 p
(Contract N00014-84-C-0214)
(AD-A160965; PSR-1441) Avail: NTIS HC A04/MF A01 CSCL 20/14

Two methods are used to analyze extremely low frequency (ELF) propagation near lateral nonhomogeneities in the earth-ionosphere waveguide. The first, a full-wave integral equation, is accurate although expensive to solve and the second, a two-dimensional ray trace, is only semiquantitative, but provides physical insight. Both methods are applied to several model solar proton events (SPEs), including one based on the 23 November 1982 event, which is of special interest because simultaneous measurements of ELF signal anomalies and incident proton fluxes are available. Calculations predict a region of weak field near the Gulf of Alaska, where a submarine-borne receiver measured an unusually severe signal loss. That behavior is caused by lateral refraction, which bends the signal away from the gulf and into the disturbed polar cap, where the phase velocity of the TEM mode is lowest. The theory also predicts a region of strong field just inside the polar cap boundary, but no data are available to test that result. Localized regions of weak or strong fields will occur on links where the great-circle path is nearly tangent to a boundary between large zones with different waveguide phase velocities. Author (GRA)

N86-19500# Naval Research Lab., Washington, D. C.
SOUNDER-UPDATED STATISTICAL MODEL PREDICTIONS OF MAXIMUM USABLE FREQUENCY FOR HF SKY WAVE PREDICTIONS
M. H. Reilly and M. Daehler 30 Oct. 1985 24 p
(AD-A161041; NRL-MR-5677) Avail: NTIS HC A02/MF A01 CSCL 20/14

Measured solar parameters, such as sunspot number or 10.7 cm flux, have traditionally been used as inputs to drive statistical model predictions of maximum usable frequencies (MUFs) on HF radio sky wave paths of interest. Much greater accuracy can be obtained by using ionospheric sounder inputs to drive or update statistical model predictions, and this is demonstrated here using oblique-incidence sounder data from the DoD Solid Shield exercises on May 12-14, 1981. From analysis of ionograms collected for several paths every fifteen minutes, it is found that deployment of a reasonable number of sounders in a large area, in order to update the simple statistical model, MINIMUF, yields MUF prediction capability on unsounded communication paths in the area within 0.4 MHz rms error. This value is obtained from real-time updating and a spatial interpolation process developed here, whereby data at sounder control points is interpolated to ionospheric reflection points for communication paths of interest. The results from the interpolation are found to be at least 20-30% more accurate than updating at any one of the nearby sounder control points. The updating procedure applies under day and night conditions, and also works well in a forecasting mode (not real-time), where it is found to work better in this case than a statistical trend line approach for daytime forecasting. Author (GRA)

N86-19501# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
RELIABLE COMMUNICATION IN AN UNRELIABLE ENVIRONMENT, REVISION
Kenneth P. Birman and Thomas A. Joseph Sep. 1985 35 p
(Contract MDA903-85-C-0124; Grant NSF DCR-84-12582; ARPA Order 5378)
(AD-A161125; CU-CSD-TR-85-694-Rev) Avail: NTIS HC A03/MF A01 CSCL 17/2

We report on the design and correctness of a communication facility for a distributed computer system. The facility provides a variety of broadcast protocols, which are used to transmit messages reliably to sets of destination processes. These protocols attain high levels of concurrency while respecting application-specific ordering constraints. They also ensure that processes observe consistent orderings of events, including process failures and recoveries. A review of several uses for the protocols in a large fault-tolerant program illustrates the simplification of higher-level algorithms made possible by our approach. Author (GRA)

N86-19502# Stanford Univ., Calif. Space Telecommunications and Radioscience Lab.
AN AUTOMATIC SYSTEM FOR GLOBAL MONITORING OF ELF AND VLF RADIO NOISE PHENOMENA Technical Report, 1 Mar. 1981 - 1 Mar. 1985
Bruce R. Fortnam Jun. 1985 102 p
(Contract N00014-81-K-0382)
(AD-A161148; E450-1) Avail: NTIS HC A06/MF A01 CSCL 17/2

A new system has been developed for automatically monitoring and recording electromagnetic noise in the ELF and VLF (10-32,000 Hz) frequency band. Eight stations are under construction, to be installed at different sites around the world in order to map the geographic distribution of noise levels. This system is called the ELF/VLF Radiometer to emphasize the attention paid during its design and installation to making accurate absolute field strength measurements. The sensing instruments installed at each site consist of two dual-channel receivers, each with two crossed loop antennas. The ELF receiver covers the frequency range 10 to 500 Hz, and the VLF receiver the range 300 to 32,000 Hz. A bank of 16 narrowband (5% bandwidth) filters is used to monitor the energy present at selected frequencies throughout the range of both receivers. The output of these filters is continuously sampled by a computerized recording system, and statistical averages are computed on-site and recorded on digital tape, along with a sample of the raw digital data. GRA

N86-19503# Naval Postgraduate School, Monterey, Calif.
A VHF-FM DIGITAL SELECTIVE CALLING SYSTEM MATHEMATICAL MODEL USING GRADE OF SERVICE CRITERIA M.S. Thesis
James W. Decker Sep. 1985 118 p
(AD-A161185) Avail: NTIS HC A06/MF A01 CSCL 17/2

This thesis presents a mathematical model of a maritime VHF-FM Digital Selective Calling (DSC) System using grade of service as a criterion to determine if a single DSC channel can accommodate both distress and commercial calling. The model calculates the probability of a call being delayed, the average delay of a call, the probability of a call being answered within a certain time frame, and the throughput for the random access calling systems of ALOHA, Slotted ALOHA, Slotted ALOHA with Capture. GRA

N86-19504# Naval Postgraduate School, Monterey, Calif.
COMMUNICATIONS PROTOCOLS FOR MICROCOMPUTER-BASED WORKSTATIONS: A DESIGNAND IMPLEMENTATION OF AN ELECTRONIC BULLETIN BOARD SYSTEM (NPS-BBS) M.S. Thesis
In S. Park Sep. 1985 92 p
(AD-A161214) Avail: NTIS HC A05/MF A01 CSCL 17/2

The area of research for this thesis is to develop communications protocols required to support electronic mail and data transfer service through voice graded telephone lines using modems. This

thesis concentrated on prototyping an IBM-PC based Electronic Bulletin Board System (NPS-BBS). Major features of NPS-BBS include electronic mail and data transfers as well as electronic notepad, on-line conversation, and running BBS under a multitasking operating system with Multilink between remote and distributed microcomputer based workstations. GRA

N86-19505# Technische Hogeschool, Delft (Netherlands). Venstergroep: Microgolven/Watergolven.
ANALYSIS METHOD FOR SPECKLE IN RADAR IMAGERY SYSTEMS [EEN ANALYSEMETHODE VAN SPECKLE IN BEELDVORMENDE RADARSYSTEMEN]
H. C. Peters Jul. 1985 36 p refs In DUTCH
(Rept-I85.68220.001; BCRS-85-01) Avail: NTIS HC A03/MF A01

Expressions for the speckle spectrum of airborne radar imagery systems related to the autocorrelation function of the position dependant echo strength of the soil were derived. In the characteristics of speckled images obtained with coherent microwaves, statistical information concerning the object texture, relative to the sensor, is stored. After nonlinear elaboration by a quadratic detector, the intensity is written as the sum of median effect and speckle fluctuations. Based on a Gauss antenna diagram and pulse function, an expression for the median effect spectrum, related to the echo strength spectrum, is found via a spatial low pass filter. Speckle spectrum expressions in x- and y-direction related to the echo dispersion function of the surface are found. Author (ESA)

N86-19506# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
MEASURING RESULTS IN KNOWING. ELECTROMAGNETIC INTERFERENCE MEASURING METHODS: REQUIREMENTS, PROCEDURES AND EQUIPMENT
C. Wagemaker 17 Jan. 1985 7 p In DUTCH; ENGLISH summary Presented at Electromagnetic Interference Workshop, Amsterdam, Netherlands, 22 Mar. 1984; sponsored by Netherlands Inst. of Registered Engineers
(NLR-MP-85008-U; B8571444) Avail: NTIS HC A02/MF A01

General requirements, measuring methods, and procedures for electromagnetic interference measuring receivers and generators to identify narrowband and broadband signals through performing conducted and radiated emission tests, including susceptibility level tests are discussed. Author (ESA)

N86-19507# Bureau of Mines, Pittsburgh, Pa.
LOW-COST FSK (FREQUENCY-SHIFT KEYING) MODERN NETWORK FOR POLLED COMMUNICATION SYSTEMS Information Circular
R. A. Watson 1985 31 p refs
(PB85-236446; DI-BM-IC-9021) Avail: NTIS HC A03/MF A01 CSCL 17B

A frequency-shift keying (FSK) modulator-demodulator (modem) network has een devised for the mine-monitoring systems. This network permits an unlimited number of remote stations to communicate with one central station over the same pair of wires. The network operates at a speed of 4,800 Bd at distances up to 5 miles. The development and operation of the modems are described. The theory of operation, schematic diagrams, and printed circuit board layouts are provided. Although the modems were built for a specific application, a more general use is discussed whereby the network would operate with a typical serial channel format. GRA

N86-19508# Micro Communications, Inc., Manchester, N.H.
ELEMENT PATTERN MEASUREMENTS ON FM ANTENNA Final Report
Jun. 1985 331 p
(Contract EPA-68-03-3054)
(PB85-242436; Rept-1310; EPA-520/6-85-017) Avail: NTIS HC A15/MF A01 CSCL 09E

Data obtained from measurements of the elevation radiation patterns of five commercial FM radio broadcast antenna elements is reported. Pattern measurements were performed with the elements supported by a dielectric mast and when mounted on a section of triangular tower. Measurements were accomplished for the elevation plane throughout 360 degrees of elevation and at azimuthal angles separated by 45 degrees to fully characterize the effect of the tower on the elevation plane pattern. GRA

N86-19509# National Telecommunications and Information Administration, Washington, D.C. Inst. for Telecommunication Sciences.
STUDY OF INTERFERENCE FIELDS IN A DUCTING ENVIRONMENT
G. A. Hufford and D. R. Ebaugh Jun. 1985 49 p
(PB85-242998; NTIA-85-177) Avail: NTIS HC A03/MF A01 CSCL 17B

In a cooperative program, the Federal Communications Commission and the Institutue of Telecommunication Sciences have begun a study of interference fields that may arise in a ducting environment. This report gives some preliminary thoughts on how enhanced signal levels might be modeled and describes a measurement program that operated in Southern California. Comparisons are made between some of the first-order statistics of the data and two of the possible models and show that there still remains a large gap between our modeling abilities and reality. GRA

N86-19510# Federal Communications Commission, Washington, D. C. Office of Plans and Policy.
SPECTRUM MANAGEMENT POLICY IN THE UNITED STATES, AN HISTORICAL ACCOUNT
J. O. Robinson Apr. 1985 144 p
(PB85-204550; FCC/OPP/WP81-06) Avail: NTIS HC A07/MF A01 CSCL 17B

The report recounts the early history of spectrum management by federal regulation culminating in the Radio Act of 1927 which, with little change, became Title III of the Communications Act of 1934. Using the land mobile radio services as a case study, the results of spectrum management by regulation are reviewed. It was found that long delay in arriving at management decisions, especially in the matter of spectrum allocation, has been a prominent feature of regulation. This delay has been due primarily to the inability of the regulatory process to acquire the necessary information on which to base decisions with the public interest as the sole criterion. This delay has resulted in social costs in the form of foregone spectrum use. The report concludes that the deficiencies cited are inherent in regulated spectrum management and that they will persist unless market forces are permitted significantly to influence spectrum management decisions. GRA

N86-20186# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF INVESTIGATING STAR SYSTEMS BY RADAR Abstract Only
O. N. Rzhiga *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 83 Transl. into ENGLISH from Astronomicheskiy Zhurnal (Moscow, USSR), v. 62, no. 3, May - Jun. 1985 p 500-505 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N86-19511 Utah Univ., Salt Lake City.
AN INTEGRATED MULTIPLE-SENSOR CHEMICAL TRANSDUCER Ph.D. Thesis
Richard Blaine Brown 1985 251 p
Avail: Univ. Microfilms Order No. DA8518395

The main goal of this work has been improving transducer accuracy. This is accomplished by replacing the single transistor of CHEMFETs with an on-chip voltage-follower amplifier, and by integrating eight of these circuits onto a multiple-sensor transducer, which realizes the following features: (1) Eight transducers and control circuitry are included on a 54 x 140 mil chip. (2) The voltage-output circuit allows sensing with the solution at ground potential, and provides high-speed, on-chip multiplexing, so that only seven connections are made to the instrumentation. (3) Matched input transistors provide inherent compensation for variations in temperature, and the symmetrical design of the circuit reduces sensitivity to light. (4) Internal feedback improves input and output impedances and transfer function stability by more than three orders of magnitude. (5) The chip provides all of the data needed to implement multi-dimensional signal processing algorithms for separating desired signals from those of interfering chemicals. Dissert. Abstr.

N86-19512 New South Wales Univ., Kensington (Australia).
FINITE WORDLENGTH CONSIDERATIONS IN THE IMPLEMENTATION OF DIGITAL FILTERS Abstract Only
Subramanian Sridharan Mar. 1985 3 p
Avail: Issuing Activity

Several new approaches to improve the finite wordlength (FWL) performance of digital filter structures are presented. To reduce the coefficient wordlength, a new scheme is proposed, in which use is made of the error arising uantization of the filter coefficients, to correct the output of the filter. to reduce the state wordlength, a scheme is proposed, in which the state quantization residue is split into two parts (bit-sliced), and processed by separate feedback networks. The correction schemes for coefficients and states can be implemented with less hardware compared to conventional methods of implementing extended precision arithmetic. Furthermore, the inherent parallelism of the proposed schemes permit high speed implementations. Application of the technique to several different filter structures is demonstrated. Author

N86-19513 New South Wales Univ., Kensington (Australia). School of Electrical Engineering.
POWER SUPPLIES FOR PARTIAL DISCHARGE TESTING OF POWER CAPACITORS Abstract Only
John James Fick Mar. 1985 3 p
Avail: Issuing Activity

Power capacitors are important components in modern power systems. Power supplies that permit the detection of partial discharges in this equipment class as a diagnostic test are investigated. Tunable air-cored coils for achieving resonant conditions at power frequency are considered, but rejected in this research program because of size and cost. Very low frequency testing has been investigated by previous researchers, primarily for machine testing, is seen as a viable alternative, subject to the demonstration of suitable equipment, both to generate suitable V.L.F. voltages and to facilitate partial discharge measurement. An approach is presented relying upon an originally developed charge transfer procedure, that satisfies both requirements concurrently. Author

N86-19514 New South Wales Univ., Kensington (Australia).
THE DYNAMIC BRAKING OF INDUCTION MOTORS Abstract Only
Brian Hickman 1985 2 p
Avail: Issuing Activity

The dynamic braking of induction motors is investigated with particular emphasis on the use of zero-sequence connections. The braking performance using both ac and dc supplies is compared. A mathematical model is developed to predict both the transient and steady-state zero-sequence braking performance. To ensure accurate calculations, a model is constructed to allow for the variation of secondary parameters with frequency due to the skin effect. A method for determining the zero-sequence parameters using locked rotor variable frequency data is presented. To measure the transient acceleration torque of the machine, a rotational accelerometer is developed from a small single-phase induction motor. Good correlation between measured and calculated results is achieved during switching transients for both current and torque. Author

N86-19515* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
JFET REFLECTION SOCILLATOR Patent
Leonard L. Kleinberg, inventor (to NASA) Issued 12 Nov. 1985 6 p Filed 27 May 1980
(NASA-Case-GSC-12555-1; US-Patent-4,553,110;
US-Patent-Appl-SN-153240; US-Patent-Class-331-116-FE;
US-Patent-Class-331-117-FE) Avail: US Patent and Trademark Office CSCL 09C

A high frequency oscillator circuit is provided using a low cost junction type field effect transistor (T sub 1) with a tuned circuit connected to its gate. The frequency of operation is determined by the tuned circuit and the capacitance reflected from the source to the gate. The transistor is matched to the frequency of operation so that this frequency falls within the roll-off portion of the transistor's transconductance verses frequency curve, preferably somewhat above the 3 db point in frequency. Phase shift necessary to sustain oscillation occurs due to the operation of the transistor in the roll-off portion of the curve and the addition of a phase shifting network (R sub 1, C sub 1) at the source.
Official Gazette of the U.S. Patent and Trademark Office

N86-19516* National Aeronautics and Space Administration. Pasadena Office, Calif.
LASER ACTIVATED MTOS MICROWAVE DEVICE Patent
Joseph Maserjian, inventor (to NASA) (California Inst. of Tech., Pasadena, Calif.) Issued 23 Jul. 1985 5 p Filed 14 Oct. 1983
(NASA-Case-NPO-16112-1; US-Patent-4,531,143;
US-Patent-Appl-SN-542232; US-Patent-Class-357-23.6;
US-Patent-Class-357-30; US-Patent-Class-357-58;
US-Patent-Class-357-59) Avail: US Patent and Trademark Office CSCL 09A

A light-activated semiconductor device usable as an optoelectronic switch, pulse generator or optical detector is provided. A semiconductor device is disclosed which provides back-to-back metal-thin oxide-silicon (MTOS) capacitors. Each capacitor includes a thin, light-absorptive aluminum electrode which overlies a thin oxide layer and a lightly doped region implanted in an intrinsic silicon substrate.
Official Gazette of the U.S. Patent and Trademark Office

N86-19517*# National Aeronautics and Space Administration. Pasadena Office, Calif.
CATHODE FOR PRIMARY BATTERY Patent Application
Shiao-Ping S. Yen, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 24 May 1985 21 p
(Contract NAS7-918)
(NASA-Case-NPO-16397-1-CU; NAS 1.71:NPO-16397-1-CU;
US-Patent-Appl-SN-751643) Avail: NTIS HC A02/MF A01 CSCL 10C

A composite electrode for a Li-SOCl2 primary battery is formed of a porous layer of an elastomer binder such as chlorinated polyethylene containing a dispersion of conductive carbon particles. Primary Li-SOCl2 cells containing the porous chlorinated polyethylene binder-carbon electrode provide much higher capacity than cells containing polytetrafluorethylene-carbon electrodes probably due to the presence of more pores with more uniform size in the chlorinated polyethylene composite electrode. NASA

N86-19518*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIATION-HARD ANALOG-TO-DIGITAL CONVERTERS FOR SPACE AND STRATEGIC APPLICATIONS
Michael K. Gauthier and Armando Roberto V. Dantas 15 Nov. 1985 30 p refs Sponsored in part by Navy
(Contract NAS7-918)
(NASA-CR-176536; JPL-Pub-85-84; NAS 1.26:176536) Avail: NTIS HC A03/MF A01 CSCL 09A

During the course of the Jet Propulsion Laboratory's program

to study radiation-hardened analog-to-digital converters (ADCs), numerous milestones have been reached in manufacturers' awareness and technology development and transfer, as well as in user awareness of these developments. The testing of ADCs has also continued with twenty different ADCs from seven manufacturers, all tested for total radiation dose and three tested for neutron effects. Results from these tests are reported. Author

N86-19519# University of Southern California, Los Angeles. Computer Research Inst.
AREA ESTIMATION OF VLSI INTEGRATED CIRCUITS
F. J. Kurdahi and A. C. Parker 24 Jul. 1985 61 p
(Contract DAAG29-83-J-K047)
(AD-A160335; CRI-85-05; ARO-20637.7-EL) Avail: NTIS HC A04/MF A01 CSCL 09/5

In this report, we present the problem of estimating the area of digital integrated circuits. This problem is important for reasons of chip yield, floor planning and design turnaround time. Area estimation is to be done at different levels of hierarchy. A model is presented for estimating the dimensions of the random logic blocks of a chip, given the description of these blocks as their constituent cells and their interconnections. We will pursue this research towards building a complete area estimation system which can handle different layout methodologies, can perform estimation at higher levels of design description (namely the Register-Transfer level), and be a useful aid to floorplanning and total layout as part of the ADAM system. GRA

N86-19520# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
DEVELOPMENT OF A SYSTEM TO PRODUCE SEMICONDUCTOR INSULATOR MULTI-LAYER STRUCTURES
D. J. Dumin 26 Sep. 1985 29 p
(Contract N00014-84-K-2015)
(AD-A160350) Avail: NTIS HC A03/MF A01 CSCL 07/1

The development of Silicon-on-Sapphire (SOS) and Silicon-on-Insulator (SOI) technologies has led to applications of these technologies in high speed circuits, high density circuits, circuits with freedom from 4-layer latch-up, and radiation hard circuits. There has been significant effort aimed at commercialization of these processes. One of the major problems limiting wide spread use of SOS is the high cost of the sapphire substrate. Many attempts to produce lower cost SOI substrates using ion implantation of insulating materials and various annealing techniques to improve the crystallinity of poly crystal silicon layers have been attempted. An alternate technique to produce SOI materials has been to grow multiple heteroepitaxial silicon-insulator-silicon layers on silicon or sapphire substrates and use these layers for the fabrication of integrated circuits. Several insulators have been used in these structures. There is a continuing search for an optimum insulator to use in multiple silicon-insulator structures. One insulator that has been used for these multiple heteroepitaxial layers is boron phosphide. The purpose of the present work was to design and build an epitaxial reactor capable of growing silicon and boron phosphide layers on silicon and sapphire substrates and to use this reactor to grow layers of silicon and boron phosphide on silicon substrates. GRA

N86-19521# Rhode Island Univ., Kingston. Dept. of Mathematics.
DETECTION PERFORMANCE OF THE CIRCULAR CORRELATION COEFFICIENT RECEIVER
L. Pakula and S. Kay Sep. 1985 30 p
(Contract N00014-84-K-0527)
(AD-A160352) Avail: NTIS HC A03/MF A01 CSCL 17/9

The complex circular correlation detector is analyzed for the case of one complex sinusoid in complex white Gaussian noise. The distribution function of the squared modulus of the circular serial correlation coefficient is found when no signal is present, allowing computation of the detection threshold. For small data records, as is typical in radar applications, the performance of the correlation coefficient detector is compared to a standard DFT detector. The correlation detector outperforms the DFT detector for some sinusoidal frequencies but performs more poorly for others. The correlation detector is also shown to be a constant false alarm rate receiver and requires less computation and storage than an FFT. GRA

N86-19522# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
RESTRUCTURABLE VLSI PROGRAM Semiannual Technical Summary Report, 1 Oct. 1984 - 31 Mar. 1985
Gerald C. OLeary 31 Mar. 1985 36 p
(Contract F19628-85-C-0002; ARPA Order 3797)
(AD-A160935; ESD-TR-85-206) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report describes work performed on the Restructurable VLSI Program sponsored by the information Processing Techniques Office of the Defense Advanced Research Projects Agency during the period 1 October 1984 through 31 March 1985. GRA

N86-19523# Naval Postgraduate School, Monterey, Calif.
VIBRATION ISOLATION OF A MICROPHONE M.S. Thesis
Charles D. Stehle Sep. 1985 93 p
(AD-A161018; AD-F620003) Avail: NTIS HC A05/MF A01 CSCL 09/1

A microphone vibration isolation system using a bungee elastic suspension, designed for use in a system (NASA Project G-313) to measure the ambient noise in the Space Shuttle's payload bay during launch is described. The isolator's transmissibility was measured using a computer controlled shaker table system programmed to simulate the Shuttle's vibrational spectrum in 21 third octave bands between 20 and 2000 Hertz. Static deflection and transient response measurements verified the axial and radial transmissibility measurements. Free decay measurements were made at 5, 20, and 65 C. The isolator's natural frequency of 15 Hertz represents a substantial improvement over the isolator used previously whose lowest resonance was above 100 Hertz. Test procedures and calibration data for three microphones are included. Author (GRA)

N86-19524# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering.
INTERFACE CHEMISTRY OF TERNARY SEMICONDUCTORS: LOCAL MORPHOLOGY OF THE Hg(1-x)CdxTe-Cr INTERFACE Interim Report
A. Franciosi, P. Philip, and D. J. Peterman 15 Oct. 1985 29 p
(Contract N00014-84-K-0545)
(AD-A161034) Avail: NTIS HC A03/MF A01 CSCL 07/4

Synchrotron Radiation Photoemission studies of interfaces prepared in situ on cleaved substrates show atomic interdiffusion with Cr/Hg and Cr/Cd exchange reactions taking place at room temperature for Cr coverages less than 2A. Correspondingly, dissociated Te is released at the surface. A subsurface region 10-13 A thick is formed in which Cr atoms replace all of the Hg atoms and at least 20% of the Cd atoms. Below this subsurface the semiconductor maintains the bulk stoichiometry and the initial surface band bending. Author (GRA)

N86-19525# Naval Postgraduate School, Monterey, Calif.
GENERATION OF AN OPTIMUM HIGH SPEED HIGH ACCURACY OPERATIONAL AMPLIFIER M.S. Thesis
Patrick Gariano, Jr. Sep. 1985 139 p
(AD-A161080) Avail: NTIS HC A07/MF A01 CSCL 09/5

This research examines and discusses the feasibility of utilizing Composite Operational Amplifiers to overcome the inherent inability of IC op-amps to simultaneously perform in a very fast, very accurate mode. Composite operational amplifiers, known to provide enhanced stability, decreased sensitivity to circuit element variations, and an extended operating frequency range, can now be used to generate and operational amplifier that concurrently exhibits both high speed and high accuracy. The composite op-amp is the only generalized method known to produce and op-amp that is both very fast and very accurate. This has never before been achievable in a simple individual entity. Author (GRA)

N86-19526# Naval Postgraduate School, Monterey, Calif.
VLSI (VERY LARGE SCALE INTEGRATED CIRCUITS) DESIGN WITH THE MACPITTS SILICON COMPILER M.S. Thesis
Robert C. Larrabee Sep. 1985 266 p
(AD-A161098) Avail: NTIS HC A12/MF A01 CSCL 09/2

An analysis of the MacPitts silicon compiler is presented. The emphasis of the analysis is on the interrelationshp between algorithmic syntax and resulting circuit structure. Errors inherent to the silicon compiler are investigated, and corrections to the errors are proposed. Author (GRA)

N86-19527# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
S.M KIROV TOMSK POLYTECHNIC INSTITUTE
K. A. Khorkov 28 Oct. 1985 5 p Transl. into ENGLISH from Elektrichestvo (USSR), no. 10, Oct. 1967 p 93
(AD-A161189; FTD-ID(RS)T-0158-85) Avail: NTIS HC A02/MF A01 CSCL 09/5

On 21 April 1965, K. A. Khor'kov defended his dissertation on the topic Questions of Design of a Pulse Power Oscillator. A procedure for computing the parameters of a pulse power oscillator with allowance for the characteristics of its operation is developed and experimentally confirmed, and recommendations are given for selection of optimum values of parameters for which the power of the impulse excited oscillator is maximum at given dimensions. A procedure for computing harmonic oscillations, including tooth ripples, at critical efficiency and the current of the impulse excited oscillator is developed and experimentally confirmed. A procedure for computing power, energy and machine constant of the impulse excited generator is developed by means of which it is possible to select optimum relationships between the main dimensions of the unit and compute the volume of the active part of the impulse excited oscillator. GRA

N86-19528# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
PHASE AND AMPLITUDE MEASUREMENTS OF INDIVIDUAL DIPOLES OF 450-800 MHz, 9-ELEMENT ARRAY
H. E. King, Jimmy L. Wong, Thomas M. Plummer, and William C. Wysock 30 Sep. 1985 41 p
(Contract F04701-83-C-0084)
(AD-A161232; TR-0084A(5925-06)-3; SD-TR-85-58) Avail: NTIS HC A03/MF A01 CSCL 20/14

The results of phase and amplitude measurements of individual dipoles in a 9-element (3 x 3 configuration) array are presented. The 3 x 3 array, designed for 450 to 800 MHz operation, consists of 9 open-sleeve dipoles. Using sweep frequency measurement techniques, the phase and amplitude characteristics of each individual dipole are compared to the center element for both vertical and horizontal polarizations. GRA

N86-19529# Illinois Univ., Urbana. Coordinated Science Lab.
A STUDY OF CROSSTALK AND DISTORTION OF HIGH SPEED PULSES IN DIGITAL CIRCUITS
S. Castillo and R. Mittra Mar. 1985 60 p
(Contract N00014-84-C-0149)
(AD-A161261; R-1033; IU-UILU-ENG-85-2208) Avail: NTIS HC A04/MF A01 CSCL 20/14

Crosstalk and distortion of high speed pulses due to multiple reflections are studied. The moment method is used to solve for the currents and charges on a set of parallel microstrip transmission lines. Next, these solutions are employed to construct the capacitance and inductance matrices for the system. A modal analysis of an n-line transmission line system is used to evaluate the dependence of crosstalk on line spacing and inpute pulse risetime. Other results are given which demonstrate the difficulty of obtaining accurate data for poorly matched loads. GRA

N86-19530# Argonne National Lab., Ill.
MICROCOMPUTER CONTROLLED CURRENT SHARING EXPERIMENTS WITH PARALLEL CONVERTORS
Robert L. Kustom and James J. Skiles (Wisconsin Univ., Madison) 1985 5 p Sponsored in part by Wisconsin Electric Utilities Foundation
(DE85-013854; ANL-HEP-CP-85-61) Avail: NTIS HC A02/MF A01

Power conditioning circuits for a Superconductive Magnetic Energy Storage (SMES) coil will require many parallel SCR devices because the operating current is planned to be as high as a few hundred thosand amperes. In order to maintain current balance in the parallel units, a microcomputer controlled system that adjusts the delay angle of individual units is envisioned. Studies and tests on an 8-H model with two parallel 9 kVA bridge circuits are described. Author

N86-19531*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF SPECIMEN PREPARATION ON THE ELECTROMAGNETIC PROPERTY MEASUREMENTS OF SOLID MATERIALS WITH AN AUTOMATIC NETWORK ANALYZER
Edward R. Long, Jr. Washington Feb. 1986 22 p
(NASA-TM-87628; L-16061; NAS 1.15:87628) Avail: NTIS HC A02/MF A01 CSCL 09C

Effects of specimen preparation on measured values of an acrylic's electomagnetic properties at X-band microwave frequencies, TE sub 1,0 mode, utilizing an automatic network analyzer have been studied. For 1 percent or less error, a gap between the specimen edge and the 0.901-in. wall of the specimen holder was the most significant parameter. The gap had to be less than 0.002 in. The thickness variation and alignment errors in the direction parallel to the 0.901-in. wall were equally second most significant and had to be less than 1 degree. Errors in the measurement f the thickness were third most significant. They had to be less than 3 percent. The following parameters caused errors of 1 percent or less: ratios of specimen-holder thicknesses of more than 15 percent, gaps between the specimen edge and the 0.401-in. wall less than 0.045 in., position errors less than 15 percent, surface roughness, hickness variation in the direction parallel to the 0.401-in. wall less than 35 percent, and specimen alignment in the direction parallel to the 0.401-in. wall mass than 5 degrees. Author

N86-19532# Lawrence Livermore National Lab., Calif.
MECHANISM OF CURRENT MODULATION BY OPTIC PHONON EMISSION IN HETEROJUNCTION TUNNELING EXPERIMENTS
C. B. Hanna, E. S. Hellman, and R. B. Laughlin 27 Aug. 1985 57 p refs Prepared in cooperation with Stanford Univ., Calif.
(Contract W-7405-eng-48)
(DE86-002152; UCID-20530) Avail: NTIS HC A04/MF A01

We explain recent observations by Hickmott, et al., of sequential longitudinal optic phonon emission in tunneling currents of GaAs-Al sub x/Ga sub 1-x As heterojunctions in terms of inhomogeneous tunneling and a magnetopolaronic mass correction. DOE

N86-19533# Department of the Army, Washington, D. C.
MILLIMETER WAVE-INFRARED BLOCH OSCILLATOR/DETECTOR Patent Application
G. J. Iafrate (Department of the Army, Washington, D.C.), R. J. Malik (Department of the Army, Washinton, D.C), and T. R. AuCoin, inventors (to Army) (Department of the Army, Washington, D.C.) Filed 5 Sep. 1985 43 p
(AD-D011950; US-Patent-Appl-SN-772971) Avail: NTIS HC A03/MF A01 CSCL 09/5

This invention relates generally to semiconductive devices and more particularly to planar doped barrier and superlattice devices. An electronic oscillator being operable to detect millimeter wave and infrared frequency output signals over the range of 1-1000GHz consists of a semiconductor device having a structure comprised of a first planar doped barrier region separated from a second planar doped barrier region by a superlattice region. Upon the application of a uniform electric field, the first planar doped barrier region operates as a means for injecting electrons into the superlattice region which then traverse to the second planar doped barrier region which operates as means for receiving the electrons. During transit through the superlattice region, the electrons undergo an oscillatory motion thereby making possible the detection

of signals whose frequency is a function of the applied voltage and the periodic spacing of the superlattice. GRA

N86-19534# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
THE POWER DENSITY SPECTRA OF SOME nB(n+1)B BLOCK CODED SIGNALS
Guenter Morgenstern Mar. 1985 111 p refs In GERMAN; ENGLISH summary
(FI-44-TBr-98) Avail: NTIS HC A06/MF A01

Power density spectra of nB(n+1)B block coded signals were investigated. The coding laws of right 1B2B block codes, including the Miller code, CMI code, Manchester code and DMI code, and of a 3B4B and a 5B6B block code were compiled according to a general criterion as nB(n+1)B block codes. A 1B2B block code called AMAZI code was proposed. The power density spectra of the signals coded according to these codes were calculated for arbitrary pulse shapes and for rectangular pulses of the entire symbol length. Explicit formulas were derived and plotted. All calculations and results refer to binary input sequences where both amplitudes are equally probable and where the amplitudes of different binary elements are statistically independent.
Author (ESA)

N86-19535# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
SIMULATION OF THE TRANSMISSION BEHAVIOR OF A GLASS FIBER SECTION, EXCLUSIVELY WITH THE HELP OF A SIMULATION PROGRAM SYSTEM FOR THE ANALYSIS OF ELECTRONIC CIRCUITS [SIMULATION DES UEBERTRAGUNGSVERHALTENS EINER GLASFASERUEBERTRAGUNGSSTRECKE MIT AUSSCHLIESSLICHER HILFE EINES SIMULATIONSPROGRAMMSYSTEMS ZUR ANALYSE ELEKTRONISCHER SCHALTUNGEN]
Gerhard Zesch Mar. 1985 94 p refs In GERMAN
(FI-441-TBr-3) Avail: NTIS HC A05/MF A01

The simulation of the transmission behavior of a glass fiber transmission section using a digital computer, and the required preparations are described. The simulation was performed only with the help of a program system for the analysis of electronic circuits. The starting points for the simulation were the circuit plans of the emitter and receiver electronics, and the results of measurements on parts of the section. Calculations were performed to experimentally demonstrate the possibility of a section simulation with the chosen simulation procedure. The calculations show that processes which are difficult to measure or inaccessible to measurements can be represented and evaluated by the present simulation. The calculated results agree with practical results.
Author (ESA)

N86-19536# Institute for Telecommunication Sciences, Boulder, Colo.
EFFECTS OF NARROW-BAND FILTERS ON THE OUTPUT ENALYTICAL EXTENSION OF THE BEDROSIAN-RICE FORMULATION
D. Middleton Apr. 1985 20 p
(PB85-216067; NTIA-CR-85-34) Avail: NTIS HC A02/MF A01 CSCL 09E

The problem of determining the wave-form distortion produced by a (symetrical) narrow-band linear filter when an off-tune, simultaneously amplitude- and angle-modulated carrier is introduced, is analytically solved by an extension of the Bedrosian-Rice approach. Here, both the instantaneous angle and envelope of the resulting narrow-band output are determined. The results provide a basis for numerical calculations and extension to the more complex problem of interference effects produced by multiple inputs of the above type. GRA

N86-19537# Science Applications International Corp., La Jolla, Calif.
JTECH(JAPANESE TECHNOLOGY EVALUATION PROGRAM) PANEL REPORT ON OPTO- AND MICROELECTRONICS Final Report
H. Wieder and W. Spicer May 1985 251 p refs
(Contract TA-83-SAC-02254; Grant NSF PRA-85-13755)
(PB85-242402; JTECH-TAR-8403; NSF/PRA-85012) Avail: NTIS HC A12/MF A01 CSCL 09E

The panel report evaluates and compares research and development (R&D) in Japan and the U.S. in solid state electronics and opto-electronics. Analysis reveals trends which, when extrapolated, suggest that quantum mechanically-based dimensionally constrained devices and integrated circuits may represent the most significant future electronic and electro-optic data and signal processing options. The Japanese are shown to be aggressive in acquiring, improving, and implementing these technologies, whose conceptual aspects were developed in the U.S. Presently, the United States' scientific and technological efforts concerning the future generation of solid state electronics are slightly ahead of Japan's; however, the Japanese are trying to maintain their adaptive product-oriented R and D while at the same time encouraging original creative fundamental and applied research on all aspects of solid state electronics and electro-optics. Continuous monitoring of trends in microelectronics is recommended. GRA

N86-19452# Joint Publications Research Service, Arlington, Va.
CONDUCTIVE OXIDES DESCRIBED
Hiroyoshi Takagi, Jyunzoh Tasaki, and Ippei Nakagawa *In its* Japan Report: Science and Technology (JPRS-JST-86-003) 11 Feb. 1986 p 53-74 refs Transl. into ENGLISH from Kogyo Zairyo (Tokyo, Japan), v. 32, no. 13, Dec. 1984 p 56-66 (For primary document see N86-19446 10-26)
Avail: NTIS HC A05/MF A01

N86-19486# Joint Publications Research Service, Arlington, Va.
PRODUCTION, APPLICATION OF PIEZOELECTRIC CERAMICS DESCRIBED
Jiro Inoue *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 16-23 refs Transl. into ENGLISH from Nikko Materials (Tokyo, Japan), Apr. 1985 p 1-4 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N86-19538 Tulane Univ., New Orleans, La.
APPLICATIONS OF THE FORMAL VARIATIONAL CALCULUS TO THE EQUATIONS OF FLUID DYNAMICS Ph.D. Thesis
John Michael Verosky 1985 116 p
Avail: Univ. Microfilms Order No. DA8515178

The Formal Variational Calculus is applied to the equations of fluid dynamics. In particular, it is shown that the equations for one-dimensional isentropic compressible flow have infinitely many higher order symmetries and a first order conservation law. The notion of a generalized fluid equation is introduced and is shown that the incompressible fluid equations inherit their Hamiltonian structure from the compressible ones. Finally, the behavior of certain Hamiltonian structures under a change in dependent variables is examined. Author

N86-19539 New South Wales Univ., Kensington (Australia).
PRECIPITATION OF CALCIUM CARBONATE AND ITS IMPACT ON HEAT EXCHANGERS OF COOLING WATER SYSTEMS Abstract Only
Cheng Hoong Kuo Nov. 1984 3 p
Avail: Issuing Activity

The solubility of calcium carbonate decreases with increasing temperature. It can therefore precipitate in cooling water systems, causing a loss of thermal efficiency. In order to be relevant to

cooling water systems, the calcium carbonate precipitation was studied in an unseeded batch stirred reactor. Three crystallographic forms of calcium carbonate were observed in the experiments covering a wide range of degrees of supersaturation, stirring speeds and temperatures. The interfacial energies of calcite and vaterite were calculated. An empirical expression for secondary nucleation incorporating power was derived. The mechanism of crystallization was established as surface-reaction controlled and the kinetics expressed by the Davies and Jones equation. This led to the calculation of overall growth rate constants of calcite and vaterite. Scaling in the heat exchangers was studied at pilot plant scale by a test rig constructed to model the Lake Liddell power station cooling water system. The threshold Langelier Index for scaling to occur was found to be 1.40 and 1.25 with ion pair consideration. This indicates that the traditional +1.0 Langelier Index recommended for power station cooling water practice is justified. The threshold Langelier Index calculated at the heat transfer surface temperature was 1.69 and 1.52 with ion pair consideration. M.G.

N86-19540 New South Wales Univ., Kensington (Australia).
A FOURIER APPROXIMATION METHOD FOR STEADY WAVES OVER TWO LAYERS OF FLUID OF DIFFERENT DENSITIES Abstract Only
Percy Pison Hibbinga Gessa Mar. 1985 3 p
Avail: Issuing Activity

Rienecker and Fenton's (1981) numerical method for steady water waves is extended to investigate the effects of varying densities on surface gravity waves for a two layer model. There are no analytical approximations made and a finite Fourier series is used to give a set of non-linear equations which can be solved by Newton's method. The necessary derivatives needed in the Jacobian matrix are evaluated numerically, making the coding rather simpler. The results obtained for the homogeneous fluid agree closely when compared with known results for wave speed from Cokelet (1977). Author

N86-19541 State Univ. of New York, Buffalo.
THE GENERATION OF CAPILLARY INSTABILITIES BY EXTERNAL DISTURBANCES IN A LIQUID JET Ph.D. Thesis
Stewart James Leib 1985 95 p
Avail: Univ. Microfilms Order No. DA8518762

The receptivity problem in a circular liquid jet is considered. A time harmonic axial pressure gradient is imposed on the steady, parallel flow of a jet of liquid emerging from a circular duct. Using a technique developed in plasma physics a causal solution to the forced problem is obtained over certain ranges of Weber number of a number of mean velocity profiles. This solution contains a term which grows exponentially in the downstream direction and can be identified with a capillary instability wave. Hence it is found that the externally imposed disturbances can indeed trigger instability waves in a liquid jet. The amplitude of the instability wave generated relative to the amplitude of the forcing is computed numerically for a number of cases. Dissert. Abstr.

N86-19542 Illinois Univ., Urbana-Champaign.
RADIATION HEAT TRANSFER IN ANISOTROPICALLY SCATTERING MEDIA Ph.D. Thesis
HaeOk Lee 1985 215 p
Avail: Univ. Microfilms Order No. DA8521814

Radiation heat transfer in anisotropically scattering media is considered. Scaling laws are formulated to predict the radiant heat flux in anisotropically scattering, one-dimensional planar media. The accuracy in scaling the radiative heat flux in isothermal, homogeneous media is shown to be excellent. The radiant scaling laws are applied to combined mode heat transfer problems which require the solution of the energy equation for the temperature profile. The average incident radiation which represents the radiation contribution to the energy equation, is accurately scaled by the multilayer solution technique. The heat flux and the temperature distributions are predicted accurately. A single scattering experiment is developed to study anisotropically scattering media in the infrared. The stationary detection system measures the angular scattered energy at selected wavelengths. Direct comparison of the experimental phase function data with Mie theory calculations is presented for a test medium of soda-lime glass beads with a known size distribution and published refractive indices. The computations predict scatterin phase functions and asymmetry factors based upon Mie theory for any size distribution and optical properties. The good agreement in the phase functions and the asymmetry factors validate the experimental setup. Dissert. Abstr.

N86-19543 Rensselaer Polytechnic Inst., Troy, N.Y.
NUMERICAL ANALYSIS AND OPTIMAL CONTROL OF FLUID TRANSIENTS DUE TO VALVE OPERATIONS Ph.D. Thesis
Roger Cheng-Fang Hsiao 1985 175 p
Avail: Univ. Microfilms Order No. DA8519496

Transient-state flow of highly compressible liquids through closed conduits with linearly elastic walls are described by a set of quasi-linear, hyperbolic, partial differential equations. Two numerical methods, Richtmyer and MacCormack methods with modifications, are introduced to analyze the transient flows due to valve operations. These two-step methods yield conditionally stable computation and second-order accuracy. The details of these methods as well as characteristics methods for a typical single pipeline system are presented and compared. It is shown that with the largest possible grid-mesh ratio these second-order methods provide better accuracy than characteristics method does for those piping system whose friction losses are relatively important and whose fluid is highly compressible. Characteristics method yields unstable computation for such a system. Transient flow caused by valve operations can be controlled by operating the valve in a proper manner. A control system approach to determine this optimal valve control is presented also. Dissert. Abstr.

N86-19544 Illinois Univ., Urbana-Champaign.
EXPERIMENTAL AND MATHEMATICAL MODELING OF THE INTERACTION OF A PERTURBED FREE SHEAR LAYER WITH A FLAT PLATE Ph.D. Thesis
Parviz Merati 1985 179 p
Avail: Univ. Microfilms Order No. DA8521834

A mathematical model which predicts the upstream effects of the impingement of shear layers on a solid boundary located in the linear region of the shear layer is developed. The model is compared with experimental results. The experimental results and the model suggest that the oscillations that are most amplified are those whose feedback signals from the disturbance plate are nearly in phase with the wave at the splitter plate separation edge. This causes the frequency of the oscillations to gradually decreases as the plate is moved downstream. This drop continues until a certain impingement length is reached where the oscillations can not sustain themselves and by addition of an extra wavelength between the splitter plate and plate leading edge, the phase condition is again satisfied. The effect of a plate located in the nonlinear region on the flowfield of a shear layer is investigated experimentally. This phase of the study places emphasis on the three main regions of the shear layer flow interacting with a plate: the impingement region, the plate region and the wake region. Dissert. Abstr.

N86-19545 Purdue Univ., West Lafayette, Ind.
MELTING AROUND A MIGRATING HEAT SOURCE
Mohammed Karim Moallemi 1985 341 p
Avail: Univ. Microfilms Order No. DA8520051

The problem of melting around a migrating heat source which arises in applications such as nuclear technology, geophysics and materials processing was studied. Experiments were performed with horizontal cylindrical heat sources (with either constant surface temperature or constant surface heat flux) which were designed to descend while melting the phase-change material surrounding it. The experiments with n-octadecane provided phenomenological understanding as well as quantitative data on the flow field and melting around the descending source. Important transport mechanisms were identified and the domain and extent of their

influence were investigated. Approximate analytical and numerical solution methods were developed based on realistic models inferred from the experiments. Conduction was found to be the dominant heat transfer mechanism around the lower stagnation point of the source where the source and the solid are separated by a thin melt layer. Dissert. Abstr.

N86-19546 Harvard Univ., Cambridge, Mass.
A CLASS OF INSTABILITIES ASSOCIATED WITH STREAMWISE VORTICITY Ph.D. Thesis
Carl Frederick Kemp Pearson 1985 169 p
Avail: Univ. Microfilms Order No. DA8520267

An investigation of the evolution and stability of streamwise vortical structures imbedded in shearing flows has been undertaken. An exact similarity solution for the alteration of the streamwise velocity field under the influence of a viscous, diffusing vortex is presented. A numerical scheme developed to analyze the linear stability of the derived flowfields is described; validation of the approach in flows whose stability is known is undertaken. The method is then applied to the problem of the stability of the actual vortex induced flow field; linear instability with strong analogies to classical two dimensional inviscid theory is found over a range of relevant physical parameters. The relevance of the calculation to the observed instabilities of coherent vortical structures in turbulent flows is discussed. Dissert. Abstr.

N86-19547 Louisiana State Univ., Baton Rouge.
THE VELOCITY AND SHAPE OF GAS SLUGS RISING IN VERTICAL TUBES AND RECTANGULAR SLOTS Ph.D. Thesis
Henry Valma Nickens 1984 310 p
Avail: Univ. Microfilms Order No. DA8515148

The rise of a large gas bubble, or slug, through a closed, vertical, liquid filled channel of infinite length was investigated by means of potential flow theory. Three channel geometries are considered: circular tube, two dimensional rectangular channel and three dimensional rectangular slot. The effect of interfacial surface tension is explicitly accounted for by application of the Kelvin-LaPlace equation, thus making the bubble shape and integral part of the solution. For the circular tube of radius R and diameter D, the solution is expressed in terms of the Stokes Stream Function which consists of an infinite Bessel Function series. The resultant equations were solved numerically for the first six terms in the series. Dissert. Abstr.

N86-19548 Rensselaer Polytechnic Inst., Troy, N.Y.
A SIMPLIFIED APPROACH TO LAMINAR SEPARATION BUBBLES Ph.D. Thesis
Cynthia M. Poslusny 1985 258 p
Avail: Univ. Microfilms Order No. DA8519510

A simple method is developed for modeling the flow and heat transfer in steady two-dimensional laminar boundary layer flows containing thin separation bubbles. The boundary layer in the local interactive region is divided into two1 layers: a viscous region near the wall and a quasi-inviscid rotational layer. The streamline which divides these two regions is somewhat arbitrary at the outset; but numerous calculations and comparisons with interacting boundary layer and triple-deck results show that, within a certain range based on the length scale of the problem, the results are insensitive to its choice. The viscous layer establishes a simple relationship between the pressure distribution and either the wall shear stress or streamline variation. Investigions of solutions to these equations show that certain constraints must be satisfied by a pressure distribution at and between separation and reattachment, thus demonstrating why difficulties are encountered in calculating through separation with a fixed pressure distribution. Furthermore, the general features of the solutions which can be obtained through an inverse method of solution be qualitatively typical of separated flows. When this model is applied to several basic geometries, solution of the nonlinear ordinary differential equation for the pressure and that for the outer elliptic flow which includes the displacement effect of the boundary layer requires only several seconds of computation time yet yields results for the boundary layer quantities of interest that agree well with results of detailed numerical investigations. Dissert. Abstr.

N86-19549 Notre Dame Univ., Ind.
A NUMERICAL INVESTIGATION OF VISCOUS, INCOMPRESSIBLE FLOW PAST AN AXISYMMETRIC BODY WITH AND WITHOUT SPIN Ph.D. Thesis
Kurt Francis Weber 1985 141 p
Avail: Univ. Microfilms Order No. DA8520690

This study deals with a preliminary investigation of the effects of spin on the axisymmetric flow past a body of revolution. The study has its genesis larger problem of Magnus forces on spinning bodies at angle of attack. However, the fundamental behavior that arises when a spinning body is placed in a uniform stream is still not well understood; therefore, the problem of axisymmetric flow with spin was undertaken. The body consists of a 3-caliber cant-ogive blunted by a spherical nosecap, a 2-caliber cylindrical section, and a 1-caliber boattail. Numerical solutions of the compressible laminar Navier-Stokes equations are obtained using a modified version of the implicit-explicit method developed by MacCormack in 1981. The benchmark problem is the nonspinning body in uniform flow at a Reynolds number of 1.14. The results show that the modified method performs well and allows time steps that are in order of magnitude greater than those permitted by explicit stability criteria. Dissert. Abstr.

N86-19550 California Inst. of Tech., Pasadena.
EFFECTS OF A PERIODIC DISTURBANCE ON STRUCTURE AND MIXING IN TURBULENT SHEAR LAYERS AND WAVES Ph.D. Thesis
Frederick Allen Roberts 1985 226 p
Avail: Univ. Microfilms Order No. DA8519561

Large scale structure and mixing processes are investigated in chemically reacting wakes and shear layers to which a periodic disturbance is applied. A diffusion limited acid base reaction is employed to directly measure the extent of mixing. Optical diagnostics used include laser absorption and laser induced fluorescence. Absorption of laser light by reacted product provides a measure of cross stream average product. Fluorescence was measured to obtain the product distribution across the layer. Forcing artificially extends the lifetime of vortices whose size is consistent with the disturbance wavelength. Amalgamation of smaller vortices is enhanced over that in the natural layer until the frequency locked scale is achieved. At high Reynolds number product measurements show reduction of product with forcing. At moderate Reynolds numbers, on the other hand, there is an increase in product when forced. The differences are related to the different effects of forcing on entrainment, composition ratio and secondary structure. Dissert. Abstr.

N86-19551 Lehigh Univ., Bethlehem, Pa.
THE VISCOUS FLOW INDUCED NEAR A WALL BY COUNTER-ROTATING VORTEX PAIRS AND VORTEX LOOPS Ph.D. Thesis
Seyhan Ersoy 1985 352 p
Avail: Univ. Microfilms Order No. DA8516248

Vortex motion above walls is observed in a variety of physical situations. All of the vortex flows considered in this study are related to more complex vortex flows observed in a diverse variety of physical situations. The boundary layer induced by a pair of counter-rotating rectilinear vortices in motion above a plane in an otherwise stagnant fluid is addressed. A symmetric situation is considered where both vortices are equidistant from the wall. An asymmetric situation is considered where a counter-rotating pair approaches the wall at angle of attack. The calculated results for the boundary layer flow reveal a variety of unusual and complex unsteady separation effects; in most cases, the numerical solutions ultimately show strong localized and explosive boundary layer growth. The calculated results suggest that a boundary layer eruption is to be expected once a vortex pair is close to the wall. The motion of three-dimensional vortex loops which have a plane of symmetry is considered. Dissert. Abstr.

N86-19552 Rensselaer Polytechnic Inst., Troy, N.Y.
AN EXPERIMENTAL STUDY IN LEADING EDGE SEPARATING-REATTACHING BOUNDARY LAYER FLOWS Ph.D. Thesis
William James Bellows, Jr. 1985 247 p
Avail: Univ. Microfilms Order No. DA8519483

Laminar separation and turbulent reattachment was investigated. The study was conducted on a simple, two-dimensional geometry in a low speed wind tunnel facility. A recently developed constant heat flux surface, instrumented with thermocouples, was used to acquire local heat transfer coefficients. Velocity, temperature, and turbulence intensity profiles were measured using a hot wire sensor as a dual purpose anemometer and resistance thermometer. A precise examination of the reattaching flow lead to the conclusion that the flow was in a highly nonequilibrium state, resulting in heat transfer rates greater than predicted by equilibrium theories or computer codes. The conclusion to be reached is that the use of a simple turbulent heat transfer mechanism at reattachment is incorrect. The key to revising such near equilibrium models is to account for the higher turbulence and shear stress levels and their downstream decay.
Dissert. Abstr.

N86-19553# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
SOME ASPECTS OF SHOCK-WAVE RESEARCH
I. I. Glass Jan. 1986 114 p refs Presented at the 24th AIAA Aerospace Sciences Meeting, Reno, Nev., 7 Jan. 1986
(UTIAS-Review-48; AIAA-86-0306; ISSN-0082-5247) Avail: NTIS HC A06/MF A01

Examples are given of shock-wave phenomena on Earth and in space. A specific shock-wave research problem, namely, pseudostationary oblique shock-wave reflections in perfect and imperfect gases is presented. Consideration is given to what has been achieved to date by using two- and three-shock theory to predict what type of reflection results when a planar shock wave M sub s, in a shock tube, collides with a sharp compressive wedge of angle, theta sub w. Experimental (interferometric and other optical) data are presented in (M sub s, theta sub w)-plots for argon, nitrogen, oxygen, air carbon-dioxide, Freon 12 and sulfurhexafluoride, in order to check the validity of the analytically predicted regions and transition lines of the four types of reflection (RR, SMR, CMR, DMR). Some disagreements are noted and discussed. Our interferometric isopycnic data are also compared with state-of-the-art computational results from a solution of the inviscid Euler equations using a CRAY I computer. Good agreement was obtained, yet, it would be important to obtain new data by solving the Navier-Stokes equations, as well as the rate equations for imperfect-gas excitations, in order to judge the improvement obtained with real-flow interferograms. Author

N86-19554*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WAVE PHENOMENA IN A HIGH REYNOLDS NUMBER COMPRESSIBLE BOUNDARY LAYER Final Report
Alvin Bayliss (Exxon Corporate Research Science Labs.), Lucio Maestrello, Paresh Parikh (Vigyan Research Associates, Inc., Hampton, Va.), and Eli Turkel Nov. 1985 26 p refs Presented at Workshop on Stability of Time-Dependent and Spatially Varying Flows Submitted for publication
(Contracts NAS1-17070; NAS1-18107; NAS1-17919)
(NASA-CR-178025; ICASE-85-56; NAS 1.26:178025) Avail: NTIS HC A03/MF A01 CSCL 20D

Growth of unstable disturbances in a high Reynolds number compressible boundary layer is numerically simulated. Localized periodic surface heating and cooling as a means of active control of these disturbances is studied. It is shown that compressibility in itself stabilizes the flow but at a lower Mach number, significant nonlinear distortions are produced. Phase cancellation is shown to be an effective mechanism for active boundary layer control.
Author

N86-19555*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A MODEL FOR THE INFLUENCE OF PRESSURE ON THE BULK MODULUS AND THE INFLUENCE OF TEMPERATURE ON THE SOLIDIFICATION PRESSURE FOR LIQUID LUBRICANTS
Bo O. Jacobson and Pascal Vinet 1986 21 p refs Proposed for presentation at the 1986 AMSE/ASLE Tribology Conference, Pittsburgh, Pa., 19-22 Oct. 1986
(NASA-TM-87230; E-2833; NAS 1.15:87230) Avail: NTIS HC A02/MF A01 CSCL 20D

Two pressure chambers, for compression experiments with liquids from zero to 2.2 GPa pressure, are described. The experimentally measured compressions are then compared to theoretical values given by an isothermal model of equation of state recently introduced for solids. The model describes the pressure and bulk modulus as a function of compression for different types of lubricants with a very high accuracy up to the pressure limit of the high pressure chamber used (2.2 GPa). In addition the influence of temperature on static solidification pressure was found to be a simple function of the thermal expansion of the fluid. Author

N86-19556*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STARVATION EFFECTS ON THE HYDRODYNAMIC LUBRICATION OF RIGID NONCONFORMAL CONTACTS IN COMBINED ROLLING AND NORMAL MOTION
M. K. Ghosh, B. J. Hamrock (Ohio State Univ., Columbus), and D. E. Brewe (Army Aviation Research and Technology Activity, Cleveland, Ohio) 1986 28 p refs
(NASA-TM-87174; E-2817; NAS 1.15:87174; USAAVSCOM-TR-85-C-20) Avail: NTIS HC A03/MF A01 CSCL 20D

The effect of inlet starvation on the hydrodynamic lubrication of lightly loaded rigid nonconformal contacts in combined rolling and normal motion is determined through a numerical solution of the Reynolds' equation for an isoviscous, incompressible lubricant. Starvation is effected by systematically reducing the fluid inlet level. The pressures are taken to be ambient at the inlet meniscus boundary and Reynolds' boundary condition is applied for film rupture in the exit region. Results are presented for the dynamic performance of the starved contacts in combined rolling and normal motion for both normal approach and separation. During normal approach the dynamic load ratio (i.e. ratio of dynamic to steady state load capacity) increases considerably with increase in the inlet starvation. The effect of starvation on the dynamic peak pressure ratio is relatively small. Further, it has been observed that with increasing starvation, film thickness effects become significant in the dynamic behavior of the nonconformal contacts. For significantly starved contacts the dynamic load ratio increases with increase in film thickness during normal approach and a similar reduction is observed during separation. A similar effect is noted for the dynamic peak pressure ratio. Author

N86-19557*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF CFD TO AEROTHERMAL HEATING PROBLEMS
Michele G. Macaraeg Jan. 1986 13 p refs Presented at the 24th AIAA Aerospace Sciences Meeting, Reno, Nev., 6-9 Jan. 1986
(NASA-TM-87670; NAS 1.15:87670) Avail: NTIS HC A02/MF A01 CSCL 20D

Numerical solutions of the compressible Navier-Stokes equations by an alternating direction implicit scheme, applied to two experimental investigations are presented. The first is cooling by injection of a gas jet through the nose of an ogive-cone, and the second is the aerothermal environment in the gap formed by the wing and elevon section of a test model of the space shuttle. The simulations demonstrate that accurate pressure calculations are easily obtained on a coarse grid, while convergence is obtained after the residual reduces by four orders of magnitude. Accurate heating rates, however, require a fine grid solution, with convergence requiring at least a reduction of six orders of magnitude in

the residual. The effect of artificial dissipation on numerical results is also assessed. E.A.K.

N86-19558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TWO-PHASE FLOWS AND HEAT TRANSFER WITHIN SYSTEMS WITH AMBIENT PRESSURE ABOVE THE THERMODYNAMIC CRITICAL PRESSURE
R. C. Hendricks, M. J. Braun (Akron Univ., Ohio), and R. L. Mullen (Case Western Reserve Univ., Cleveland, Ohio) 1986 8 p refs Proposed for presentation at the 8th International Heat Transfer Conference, San Francisco, Calif., 17-22 Aug. 1986
(NASA-TM-87228; E-2897; NAS 1.15:87228) Avail: NTIS HC A02/MF A01 CSCL 20D

In systems where the design inlet and outlet pressures P sub amb are maintained above the thermodynamic critical pressure P sub c, it is often assumed that heat and mass transfer are governed by single-phase relations and that two-phase flows cannot occur. This simple rule of thumb is adequate in many low-power designs but is inadequate for high-performance turbomachines, boilers, and other systems where two-phase regions can exist even though P sub amb > P sub c. Heat and mass transfer and rotordynamic-fluid-mechanic restoring forces depend on momentum differences, and those for a two-phase zone can differ significantly from those for a single-phase zone. By using a laminar, variable-property bearing code and a rotating boiler code, pressure and temperature surfaces were determined that illustrate nesting of a two-phase region within a supercritical pressure region. The method of corresponding states is applied to bearings with reasonable rapport. E.A.K.

N86-19559# AETA Corp., Dover, N.H.
LIQUID-VAPOR FLOW REGIME TRANSITIONS FOR USE IN DESIGN OF HEAT TRANSFER LOOPS IN SPACECRAFT: AN INVESTIGATION OF TWO-PHASE FLOW IN ZERO GRAVITY CONDITIONS Final Report, 21 Sep. 1984 - 21 Mar. 1985
T. W. Lovell May 1985 125 p
(Contract F33615-84-C-3413)
(AD-A159646; AFWAL-TR-85-3021) Avail: NTIS HC A06/MF A01 CSCL 20/4

The behavior of viscous (or low velocity) two-phase vapor-liquid flow under zero gravity was simulated in the laboratory by using two immiscible fluids of equal density flowing together in a one inch diameter glass tube. The fluids used were Polypropylene Glycol (PPG) which simulated the liquid phase and water which simulated the vapor phase. Various tests were conducted varying flow rates and entrance conditions. Four existing flow regime models were analyzed, modeled on a computer, and extrapolated to predict zero-gravity conditions. The flow regimes were the Horizontal Dukler-Taitel, Vertical Dukler-Taitel, Vertical Weisman and Horizontal Weisman. None of these models when extrapolated to zero-g conditions agreed well with the lab data, and some of the observed flow regimes were not predicted at all. GRA

N86-19560# Naval Postgraduate School, Monterey, Calif.
THE EFFECTIVENESS OF HEAT EXCHANGERS WITH ONE SHELL PASS AND THREE TUBE PASSES M.S. Thesis
M. S. OHare Jun. 1985 205 p
(AD-A159706) Avail: NTIS HC A10/MF A01 CSCL 20/13

Heat exchangers with one shell pass and n tube passes are often referred to as 1-n exchangers. The heat transfer literature contains many references to studies of 1-n exchangers when n is even but apparently little work has been done with respect to the 1-n exchanger when n is odd. This thesis greatly expands the theoretical study of 1-n exchangers with n being odd. While a completely closed form solution was found to be unfeasible, a polynomial approximation has been developed that yields the effectiveness (epsilon) of the two possible arrangements of the 1-3 exchanger as a function of the capacity rate ratio (R) and the number of transfer units (N sub tu). It is also shown that the effectiveness of the arrangement with two counterflow and one parallel flow tube side passes exceeds that of some of the 1-n exchangers with n even. GRA

N86-19561# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
TURBULENT NONCONDENSING AND CONDENSING GAS JETS IN LIQUIDS Final Report, 15 Dec. 1984 - 31 Jul. 1985
T. Y. Sun, S. G. Chuech, R. N. Parthasarathy, and G. M. Faeth Aug. 1985 43 p
(Contract N00014-85-K-0148)
(AD-A160326) Avail: NTIS HC A03/MF A01 CSCL 20/4

Gas injection into liquids is a fundamental multiphase flow which has several direct applications, e.g., stored chemical energy propulsion systems (SCEPS), direct-contact condensers, gas dissolution systems, reservoir destratification systems and nuclear-reactor pressure suppression systems. Stability of these flow is enhanced when an underexpanded jet is used; therefore, the interaction of supersonic wave structures with liquids in turbulent flow is also an issue. The objective of this phase of the study was to develop test apparatus relating to underexpanded air jets in air and turbulent subsonic gas jets in liquids. The air-jet-in-air apparatus was assembled and flow visualization tests were completed using continuous and spark Schlieren photography. Test apparatus for gas injection in liquids was assembled. Tests were also undertaken to study injector stability. Test results showed that jet instability for subsonic (adapted) flow could be controlled by placing a screen across the jet exit and controlling gas release at the surface or the bath (which can cause undesirable pressure fluctuations in the bath). For stable jets, the liquid/gas interface is continous near the jet exit and its position is influenced by the degree of underexpansion. A bubble cloud was observed near the interface, and it is also probable that a drop cloud in present as well. Analysis of this flow for subsonic jet exit conditions was implemented using the locally homogeneous flow approximation of multiphase flow. GRA

N86-19562# Calspan Advanced Technology Center, Buffalo, N.Y.
NON-REACTING MIXING COMPONENTS. REVISION 1 Final Report, Nov. 1979 - Aug. 1985
C. Padova Sep. 1985 164 p
(Contract F04611-80-C-0011)
(AD-A160894; CALSPAN-6632-A-3-Rev-1;
AFRPL-TR-85-066-Rev-1) Avail: NTIS HC A08/MF A01 CSCL 20/4

Detailed measurements of pressure, temperature and gas composition in coflowing streams have been obtained for a variety of relative Mach numbers and density ratios. These measurements were aimed to provide a comprehensive data base from which compressibility corrections can be calculated for the turbulence models used in the JANNAF Standard Plume Flowfield Model (SPF). Using a short-duration testing technique, low altitude non-reacting plume flowfields were simulated in which compressible turbulent mixing of coaxial supersonic jets occurred in a preevacuated altitude chamber. A ratio of the mixing jet diameters of 13:1 was obtained using an apparatus consisting of a 3-inch exit diameter nozzle/supply within the large-scale Calspan Ludwieg Tube. GRA

N86-19563# Wisconsin Univ., Madison. Mathematics Research Center.
CONCAVITY OF SOLUTIONS OF THE POROUS MEDIUM EQUATION Technical Summary Report
Philippe Benilan and Juan L. Vazquez Aug. 1985 27 p
(Contract DAAG29-80-C-0041)
(AD-A160969; MRC-TSR-2851) Avail: NTIS HC A03/MF A01 CSCL 12/1

The flow of a gas through a porous medium is governed by a degenerate quasilinear parabolic equation. It is known that the nonnegative solutions to this equation possess a lower bound for the second derivative of the pressure in the spatial variables. This bound plays an important role in the mathematical treatment and is related to the entropy of the flow. Since the solutions exhibit interfaces across which v sub x jumps positively, no upper bound is possible globally for v sub xx. Nevertheless it is proven that the concavity of v(.,t) in the region where v is positive is preserved in time. This is in itself an interesting geometric property of the

solution. It also allows one to obtain precise information about the asymptotic behavior of the flow. GRA

N86-19564# Wisconsin Univ., Madison.
ON THE SECONDARY BIFURCATION OF THREE DIMENSIONAL STANDING WAVES Technical Summary Report
Thomas J. Bridges Jul. 1985 56 p
(Contract DAAG29-80-C-0041)
(AD-A160971; MRC-TSR-2839) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper contains and analysis of the complex set of periodic solutions which may occur in a fluid filled vessel of rectangular cross section. A previous analysis by Verma and Keller found only simple eigenvalues for the linearized problem. It is shown herein that at critical values of the vessel aspect ratio double eigenvalues occur. Eight nonlinear solution branches are emitted from these double eigenvalues. The solutions along the various branches are derived, and the results displayed graphically. It is shown that irregular waves occur along some of these branches. In an interesting development, Bauer, Keller, and Reiss, in their analysis of shell buckling, showed that the splitting of multiple eigenvalues may lead to secondary bifurcation. This theory is applied to the nonlinear standing wave problem herein, and it is shown that secondary bifurcation does occur in the neighborhood of the double eigenvalue. A perturbation method is used to find the secondary bifurcation points, and the solutions along the secondary branches, in the neighborhood of their respective branch points, are found. The neighborhood around the critical aspect ratios is substantial, suggesting that secondary branching may occur in a variety of vessels with rectangular cross section. This theory offers an explanation of the irregular waves often observed in the sloshing of fluid in a rectangular vessel. GRA

N86-19565# Wisconsin Univ., Madison. Mathematics Research Center.
THE MOTION OF ELLIPSOIDS IN A SECOND ORDER FLUID Technical Summary Report
Sangtae Kim Sep. 1985 27 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-82-10950)
(AD-A160973; MRC-TSR-2864) Avail: NTIS HC A03/MF A01 CSCL 12/1

The rigid body motion of an ellipsoid in a second order fluid (SOF) under the action of specified (time independent) external forces and torques have been obtained to first order in the Weissenberg number by inverting the resistance relations for the force an torque under specified rigid body motions. The reciprocal theorem of Lorentz was used to bypass the calculation of the O(W) velocity field. The results agree with known analytic solutions for SOF with the secondary to primary normal stress ratio of -1/2. The solution procedure was also tested by computing the torque on a translating prolate spheroid with aspect ratios ranging from slender bodies to near-spheres. One result is that for a SOF with zero secondary normal stress (Weissenberg fluid), previous asymptotic results for near-spheres were found to be accurate even at fairly large aspect ratios. New results of nondegenerate ellipsoids suggest that the orientation (as monitored by Euler angles) and trajectory of sedimenting, nonaxisymmetric particles such as ellipsoids provide useful information on the rheology of the suspending fluid. Author (GRA)

N86-19566# Wisconsin Univ., Madison. Mathematics Research Center.
CALIBRATION OF HOLE-PRESSURE MEASUREMENTS IN NON-NEWTONIAN FLOW BY NUMERICAL METHODS Technical Summary Report
David S. Malkus Sep. 1985 17 p
(Contract DAAG29-80-C-0041; Grants AF-AFOSR-0141-85; NSF MCS-79-03542; NSF MCS-81-02089; NSF MCS-83-01433)
(AD-A160974; MRC-TSR-2863) Avail: NTIS HC A02/MF A01 CSCL 12/1

The crossed-triangle macroelement has been identified as and ideal element for Newtonian fluid flow calculations involving fluids with integral constitutive equations. In spite of an instability of the pressure approximation, these elements have been shown to have convergent velocities in Stokes flow, and there is strong evidence that pressure-smoothing schemes recover accurate pressures. Earlier studies by the author of Newtonian flow over transverse slots at low Reynolds numbers showed that excellent results could be obtained using the element. Studies of non-Newtonian flows in the same geometry showed good qualitative agreement with laboratory experiment but led to some puzzling predictions of the pressure difference between the top and bottom of the slot (the hole-pressure). In this paper, those puzzling predictions are reexamined, and the deviations from expectation are reinterpreted. They appear to make physical sense and have important ramifications for the calibration of devices which measure the primary normal-stress difference by continuous measurement of the hole-pressure. Author (GRA)

N86-19567# Wisconsin Univ., Madison. Mathematics Research Center.
A FAST ALGORITHM FOR NON-NEWTONIAN FLOW Technical Summary Report
David S. Malkus Sep. 1985 14 p
(Contract DAAG29-80-C-0041; Grants AF-AFOSR-0141-85; NSF MCS-79-03542; NSF MCS-81-02089)
(AD-A160977; MRC-TSR-2860) Avail: NTIS HC A02/MF A01 CSCL 12/1

The goals of the project described here are twofold: (1) to turn an existing pilot algorithm for the steady flow of non-Newtonian memory fluids into a robust and efficient algorithm; (2) render enhancements of the method's current capabilities computationally feasible such enhancements include fully coupled thermal dependence, material compressibility, and free surface flows. The pilot algorithm is a finite element method whose novelty lies in its computation of the stress field in a nonlinear iteration scheme. The stress at a point is a nonlocal functional of the current velocity iterate, and the pilot method has demonstrated the feasibility of reliable computation with such constitutive equations. Before the method can take its place as a reliable scientific and engineering tool, intensive effort must be made to reduce the computational cost in the manner described here. Author (GRA)

N86-19568# Wisconsin Univ., Madison. Mathematics Research Center.
A GLOBAL THEORY OF INTERNAL SOLITARY WAVES IN TWO-FLUID SYSTEMS Technical Summary Report
C. J. Amick and R. E. L. Turner Sep. 1985 95 p
(Contract DAAG29-80-C-0041; Grants NSF DMS-82-03338; NSF MCS-82-00406)
(AD-A160979; MRC-TSR-2861) Avail: NTIS HC A05/MF A01 CSCL 12/1

The study of single-crested progressing gravity waves was initiated over a century ago with the observations by Russell of what he termed solitary waves, which progressed without change of form over a considerable distance on the Glasgow-Edinburgh Canal. The mathematical analysis of this wave motion on the surface of water, begun in the nineteenth century, has undergone a rapid development in the last three decades, due to the scattering theory for the Korteweg-de Vries equation, which models the motion of long waves due to the development of techniques in nonlinear analysis allowing for the analysis of finite amplitude motions. The work on surfce waves has many parallels in the study of waves in fluids with variable density. In the case of a heterogeneous fluid with a free upper surface, gravity waves still occur, in analogy with surface waves in a fluid of constant density. What is distinctive about a fluid with density stratification, however, is the presence of waves which are predominantly due to the stratification and not to the free surface. These waves, called internal waves, exist in a heterogeneous fluid even when it is confined between horizontal boundaries, a configuration which precludes gravity waves in a fluid of constant density. This paper is concerned with progressing solitary gravity waves in a system consisting of two fluids of differing densities confined in a channel of unit depth and infinite horizontal extent. GRA

N86-19569# Naval Postgraduate School, Monterey, Calif.
THE EFFECTIVENESS OF HEAT EXCHANGERS WITH ONE SHELL PASS AND FIVE TUBE PASSES M.S. Thesis
Lawrence E. Hess Sep. 1985 122 p
(AD-A161019; AD-F620003) Avail: NTIS HC A06/MF A01 CSCL 13/1

Heat exchangers with one shell pass and n tube passes are often referred to as 1-n exchangers. The heat transfer literature contains many references to studies of 1-n exchangers when n is even but apparently, other than a single study and some work pertaining to the 1-3 exchanger at the Naval Postgraduate School, little work has been done with respect to the 1-n exchangers with n is odd. Ths thesis expands upon the study of 1-n exchangers with n being odd. While a completely closed form solution was found to be unfeasible, a polynomial approximation has been developed that yields the effectiveness (epsilon) of the two possible arrangements of the 1-5 exchanger as a function of the capacity rate ratio (R) and the number of transfer units (N sub tu). This will enable the analyst to consider exchangers where the inlet to and outlet from the tubes are at opposite ends of the exchanger. GRA

N86-19570# Naval Postgraduate School, Monterey, Calif.
EFFECT OF SMALL PRESSURE DISTURBANCES ON THE BREAKDOWN OF ROUND LAMINAR AND TURBULENT JETS M.S. Thesis
Zacharias Z. Gikas Sep. 1985 100 p
(AD-A161149) Avail: NTIS HC A05/MF A01 CSCL 20/4

The effect of small sinusoidal perturbations on the breakdown of circular water jets issuing from long tubes was investigated experimentally to examine how the mean velocity profile for a fully developed laminar, transitional and turbulent flow as well as the frequency affects the mechanism of breakdown of the jet flow. Observations using a high frequency stroboscope were recorded using a high speed photographic technique, for the most distinctive phenomena observed, for three selected Reynolds numbers corresponding to laminar, transitional and turbulent flow. Markedly different behavior of flow breakdown and droplet formation was observed for each of these flows as frequency waveform or phase angle was altered. GRA

N86-19571# Naval Postgraduate School, Monterey, Calif.
OSCILLATING FLOW ABOUT CIRCULAR CYLINDERS AT LOW KEULEGAN-CARPENTER NUMBERS M.S. Thesis
Nathan Q. S. Yuen Sep. 1985 40 p
(AD-A161186) Avail: NTIS HC A03/MF A01 CSCL 20/4

The in-line force and the resulting drag and inertia coefficients for smooth and rough circular cylinders immersed in a sinusoidally oscillating flow at low Keulegan-Carpenter numbers (K) have been determine experimentally and compared with those obtained theoretically by Stokes and Wang. In addition, flow visualization experiments were carried out with oscillating cylinders in a water table and the stability of the flow was investigated. The results have shown that for very low values of K, the flow about the cylinder is laminar, attached, and stable and the drag coefficient is nearly identical to that predicted theoretically. At a critical K, the flow becomes unstable to Taylor-Gortler vortices and the drag coefficient jumps to a higher value. Subsequently, the flow separates, becomes turbulent and results in a minimum drag coefficient. The subsequent increases in drag are attributed to vortex shedding. The inertia coefficient agrees with that obtained theoretically in the range where the flow is laminar. GRA

N86-19572# California Univ., Berkeley. Dept. of Mechanical Engineering.
NUMERICAL SIMULATION OF BUOYANT TURBULENT FLOW Final Report
J. A. C. Humphrey, F. S. Sherman, and W. M. To Aug. 1985 189 p
(Contract DE-AC04-76DR-00789)
(DE85-017392; SAND-85-8180) Avail: NTIS HC A09/MF A01

Two models have been developed for predicting low Reynolds number turbulent flows in the free and mixed convection regimes. One, the KEM model, is based on the notion of eddy diffusivities for momentum and heat. The other, the ASM model, is based on algebraic relations derived for the anisotropic turbulent fluxes by suitable truncation of the parent transport equations. Both formulations apply to variable property flows with high overheat ratios. A comparison between measurements and predictions for the case of the vertical plate shows that both models yield fairly accurate results for the mean flow and heat transfer. As a result, only the simpler of the two models, the KEM, was used to predict the cavity flows. Predictions for the case of the vertical flat plate show excellent agreement with measurements of mean velocity, temperature and Nusselt number. Nearwall results predicted by both models reveal the existence of a 1/3 power-law dependence. Regions of negative buoyant and shear production of turbulence kinetic energy are clearly revealed by the calculations. Author

N86-19573# Lawrence Livermore National Lab., Calif.
HARMONIC GENERATION OF ION WAVES DUE TO BRILLOUIN BACKSCATTERING
K. Estabrook, W. L. Kruer, and M. G. Haines 22 May 1985 13 p refs Presented at the CECAM Workshop Transport, Interactions and Instabilities in Laser-Plasmas, Orsay, France, 24 Sep. 1984 Prepared in cooperation with Imperial Coll. of Science and Technology, London
(Contract W-7405-eng-48)
(DE85-016072; UCRL-92739; CONF-8409229-3) Avail: NTIS HC A02/MF A01

We report results of simulations of stimulated Brillouin backscatter in which we see the second spatial harmonic of the ion density fluctuation and compare with linear, fluid theory. We also describe examples of the competition between Raman and Brillouin backscatter. DOE

N86-19574# Pittsburgh Univ., Pa. Dept. of Chemical and Petroleum Engineering.
ANALOGY APPLICATION TO NONUNIFORM GAS-SOLID FLOWS Quarterly Report
G. E. Klinzing Sep. 1985 22 p refs
(Contract DE-FG22-85PC-81504)
(DE86-002072; DOE/PC-81504/T1; QR-1) Avail: NTIS HC A02/MF A01

This report describes the measurement of high pressure solid/gas flow with a Micro-Motion meter, analyzes the effects of system-parameters on Micro-Motion signals, establishes calibration curves and pressure-drop correlations for the Micro-Motion flow-meter. The study shows that this meter could be used in measuring solid/gas flows inside a 0.0095 m, diameter pipe at high pressures, especially at solid loadings greater than 10. When the solid loading (pound of coal/pound of gas) was less than or equal to 10, pressure-drop tends to indicate a phase separation and a probable change in flow regime within the Micro-Motion Meter, which could have occurred at the meter's U-bend. (2,mn DOE

N86-19575# Tennessee Univ. Space Inst., Tullahoma. Space Inst.
THEORETICAL STUDIES OF RECIRCULATING DUCT FLOWS FOR THE UTSI MHD COMBUSTOR DESIGN
J. J. Lee, R. J. Schulz, and M. A. Scott Sep. 1985 96 p refs
(Contract DE-AC02-79ET-10815)
(DE86-000695; DOE/ET-10815/107) Avail: NTIS HC A05/MF A01

A theoretical investigation of duct flows is reported that is an extension of previous work with heat transfer and a more complex geometry considered. The program developed is general and is capable of predicting recirculating turbulent flow in either a two-dimensional Cartesian or an axisymmetric coordinate system. This is accomplished through definition of the stream function using the classic Von Mises transformation and the restructuring of the component Navier-Stokes equations into the governing equations for transport of vorticity. Such a technique is standard in computational fluid dynamics and provides a powerful means

of analyzing recirculating flows wherein the explicit dependency of the flow upon pressure is eliminated. An iterative, general finite-difference solution procedure suitable for two-dimensional elliptic flows in complex geometries is then used to solve the nonlinear partial-differential equations. The program computes the following variables in the region of interest: stream function and vorticity; axial, radial, and swirl velocity components; pressure, density and temperature; turbulent kinetic energy and its dissipation rates; axial and radial heat transfer rates. The objective of the present document is to present details of the computational solution procedure and to provide a qualitative understanding of the effects of the flow Reynolds number, the core jet width, the duct angle, the swirl velocity, the turbulent intensity and the jet position. DOE

N86-19576# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ON THE ANALYTICAL SOLUTION OF THE TWO DIMENSIONAL ACTUATOR SURFACE PROBLEM
G. Schouten Dec. 1983 54 p refs
(VTH-LR-311) Avail: NTIS HC A04/MF A01

A conformal mapping which maps the locally exact regular solution for the spiraling flow around the edge of an actuator surface with constant load onto the square root flow around the sharp edge of a half infinite plane wall is derived. Two generalizations of this mapping are constructed to allow the treatment of two idealized flow problems, both involving the constant load distribution. A numerical computation for the actuator surface problem was performed. The results show the shape of the shed vortex sheets and the streamline pattern, including the stagnation points on the free vortex sheets. The mapping procedure is satisfactory in that it shows how the spiraling regular solution of Schmidt and Sparenberg (1977) can be fitted in the framework of standard analytical techniques for the solution of flow problems. However, it does not lead to simpler solutions of the flow problems considered. Author (ESA)

N86-19577# Institut Franco-Allemand de Recherches, St. Louis (France).
GAS THERMOMETRY USING FOURIER ROTATIONAL COHERENT ANTI-STOKES RAMAN SCATTERING
Th. Lasser, E. Magens, and A. Leipertz 26 Mar. 1985 15 p refs Presented at 4th CARS Workshop, Rouen, France, 4-5 Feb. 1985
(ISL-CO-202/85) Avail: NTIS HC A02/MF A01

Periodic forms of rotational spectra were investigated to extend the application of gas thermometry. Fourier analysis offers a possibility for data reduction and a rapid temperature evaluation procedure. A recursion formula which is a direct consequence of the periodicity of the rotational spectra is presented. Neglected linewidth and laser contributions can be taken into consideration by a simple convolution with the corresponding expressions. The computation of the rotational spectra of nitrogen with 1024 data points reduced to 64 channels is shown. Two procedures, windowing and shifting down the higher frequency components, are included in the method. In the temperature range 300 to 900K the envelopes are well reconstructed. Their maximum position are clearly temperature dependent and allow a simple and rapid temperature evaluations. Author (ESA)

N86-19578# Institut Franco-Allemand de Recherches, St. Louis (France).
NUMERICAL TREATMENT OF THE YOUNG INTERFERENCE FRINGES IN THE PRESENCE OF SPECKLE [TRAITEMENT NUMERIQUE DE FRANGES D'INTERFERENCE D'YOUNG EN PRESENCE DE SPECKLE]
J. Schwab and P. Raymond 9 Nov. 1984 48 p refs In FRENCH
(Contract DRET-81-626)
(ISL-R-128/84) Avail: NTIS HC A03/MF A01

A numerical analysis to determine fringe configuration and orientation is presented. The two dimensional very fast Fourier transform is utilized. Two examples concerning laser chronophotography in instantaneous fluid velocities are included. The feasibility of the method is demonstrated, but limitations remain for the automatic computer processing, since it takes 30 min computation to visualize the results. Author (ESA)

N86-20062# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF A MODEL OF FLOW OF STREAM OF STRATIFIED FLUID ABOUT A BODY Abstract Only
K. A. Bezhanov and A. M. Ter-Krikorov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 10 Transl. into ENGLISH from Doklady Akademii Nauk SSR (Moscow, USSR), v. 279, no. 6, Dec. 1984 p 1345-1348 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N86-19579 British Library Lending Div., Boston Spa (England).
EXPERIENCE IN USE OF VD-ZIP EDDY-CURRENT DEFECTOSCOPE FOR INSPECTION OF TUBES
S. S. Anoprienko and L. I. Bekhter [1985] 3 p Transl. into ENGLISH from Stal (USSR), no. 3, 1985 p 63
(BLL-M-36417-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

It is reported that no complaints have been received from customers in the case of tubes inspected with a BD-ZIP eddy-current defectoscope over a period of two years operation. The defectoscope power supply is from a converter with a work current frequency of 16 kHz and reliably detects not only longitudinal defects but also defects lying at an angle to the contour of the tube. Author

N86-19580* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEMPERATURE AVERAGING THERMAL PROBE Patent
Lou F. Kalil and Victor Reinhardt, inventors (to NASA) Issued 3 Dec. 1985 4 p Filed 31 Jan. 1983
(NASA-Case-GSC-12795-1; US-Patent-4,556,327;
US-Patent-Appl-SN-462508; US-Patent-Class-374-115;
US-Patent-Class-374-120; US-Patent-Class-374-163) Avail: US Patent and Trademark Office CSCL 14B

A thermal probe to average temperature fluctuations over a prolonged period was formed with a temperature sensor embedded inside a solid object of a thermally conducting material. The solid object is held in a position equidistantly spaced apart from the interior surfaces of a closed housing by a mount made of a thermally insulating material. The housing is sealed to trap a vacuum or mass of air inside and thereby prevent transfer of heat directly between the environment outside of the housing and the solid object. Electrical leads couple the temperature sensor with a connector on the outside of the housing. Other solid objects of different sizes and materials may be substituted for the cylindrically-shaped object to vary the time constant of the probe.
Official Gazette of the U.S. Patent and Trademark Office

N86-19581* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PORTABLE 90 DEGREE PROOF LOADING DEVICE Patent
Richard G. Bird (Rockwell International Corp., Downey, Calif.) and Leo A. Berson, inventors (to NASA) (Rockwell International Corp., Downey, Calif.) Issued 10 Dec. 1985 8 p Filed 3 May 1983 Sponsored by NASA
(NASA-Case-MSC-20250-1; US-Patent-4,557,149;
US-Patent-Appl-SN-491113; US-Patent-Class-73-862.54;

US-Patent-Class-73-862.01) Avail: US Patent and Trademark Office CSCL 14B

A hydraulically actuated device is described for applying a test load to a bearing or the like to prove the integrity of its mounting or staking within a bore in a housing such as gear case. To accommodate limited access situations, the device is constructed in a right angle configuration in which a hydraulic cylinder applies axial pressure to a first thrust rod assemly which includes a first thrust rod through a threated spindle driving a linearly translated cam. Cam follower wheel transfers the translation to a second thrust rod assembly which includes a horizontal shaft and a spindle within a cross-arm housing portion and a tubular housing portion. The same second thrust direction applies the bearing loading in either of two directions depending upon the shape of the interface parts. The interface parts can bear on the bearing from either side with respect to the bearing mounting structural part.

Official Gazette of the U.S. Patent and Trademark Office

N86-19582# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MODERN USES OF LANGMUIR PROBES
Francis F. Chen Nov. 1985 25 p refs
(IPPJ-750) Avail: NTIS HC A02/MF A01

The Langmuir probe is adaptable to measurements in strong RF and strong magnetic fields such as exist in many fusion related experiments. Some new techniques, mostly untested, are described which could be developed to overcome the difficulties of this diagnostic method. Author

N86-19583# National Aerospace Lab., Tokyo (Japan).
STUDY ON THE DIGITAL POSITION TRANSDUCER WITH OPTICAL TIME-DELAY PULSE
Mitsuyoshi Mayanagi Sep. 1985 40 p refs In JAPANESE; ENGLISH summary
(NAS-TR-878; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A rotary optical position transducer employing a pulse technique time-multiplexor has been studied during the development of a Fly-By-Light (FBL) for the aircraft control system, the aim of which is to offer inherent resistance to environments of electromagnetic interference (EMI), electromagntic pulse (EMP) and lightening. The conventional absolute-type optical digital transducer causes difficulty in the interface technique between the transducer and other devices such as a computer. The transducer system described in this paper, which consists of a rotary position transducer unit, a fiber-optic cable, a light source unit, and an electronics interface unit, can improve this interface technique. The rotary transducer unit is an electrically passive device that is connected through optical fibers to the light source unit and the electronics interface unit, and that has many advantages of fiber-optic techniques. This paper studies basic problems in the development of the rotary transducer system. In particular, a basis for optimizing illumination irradiance and photo-detector characteristics is given, and the intrinsic performance of the transducer is quantitatively examined. Author

N86-19584# National Aerospace Lab., Tokyo (Japan).
NONINTERACTING CONTROL OF DYNAMICALLY TUNED DRY GYRO
Hirokimi Shingu and Masao Otsuki 1985 42 p refs In JAPANESE; ENGLISH summary
(NAL-TR-857; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A new design concept of a rebalance control circuit useful both for the improvement of response characteristics and the removal of interaction is desribed. It is shown that an interaction between input and output of Tuned Dry Gyro (TDG) is caused by angular acceleration. A Direct Rebalance Loop (DRL), which is an additional circuit, has been developed, and its utility evaluated quantitatively by simulation. It is shown, as an example of response characterstics improvement by DRL, that larger amplifier gain can be adopted under stable conditions, and that settling time and overshoot decrease remarkably. However, it is also found that DRL is ineffective in reducing interaction. In order to resolve the problems, a method of reducing such interaction by using subtorquers with the main torquers is proposed. The transfer function of the loop between the signal generator and the subtorquer (NIL) is derived analytically so as to remove the interaction. Next, it is examined to see what degree of interaction can be removed by the use of NIL. and as an instance of numerical simulation, it is shown that the interaction can be reduced by less than one tenth at input frequencies of 0 to 40 Hz. Finally, it is concluded that a fundamental design concept of a noninteracting control has been established. Author

N86-19585*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR CELL CALIBRATION FACILITY VALIDATION OF BALLOON FLIGHT DATA: A COMPARISON OF SHUTTLE AND BALLOON FLIGHT RESULTS
B. E. Anspaugh, R. G. Downing, and L. B. Sidwell 15 Oct. 1985 36 p refs
(Contract NAS7-918)
(NASA-CR-176528; JPL-Pub-85-78; NAS 1.26:176528) Avail: NTIS HC A03/MF A01 CSCL 14B

The Solar Cell Calibration Facility (SCCF) experiment was designed and built to evaluate the effect of the Earth's upper atmosphere on the calibration of solar cell standards. During execution of the experiment, a collection of carefully selected solar cells was flown on the shuttle, and reflown on a high-altitude balloon, then their outputs were compared. After correction to standard temperature and intensity values of 28 C and an Earth-Sun distance of 1 AU, the solar cell outputs during the two flights were found to be identical. The conclusion is therefore that the high-altitude balloon flights are very good vehicles for calibrating solar cells for use as space flight reference standards. Author

N86-19586*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RESULTS OF THE 1985 NASA/JPL BALLOON FLIGHT SOLAR CELL CALIBRATION PROGRAM
B. E. Anspaugh and R. S. Weiss 15 Dec. 1986 41 p ref
(Contract NAS7-918)
(NASA-CR-176527; JPL-Pub-85-88; NAS 1.26:176527) Avail: NTIS HC A03/MF A01 CSCL 14B

The 1985 solar cell calibration balloon flight was successfully completed on July 12, 1985, meeting all objectives of the program. Fifty-seven modules were carried to an altitude of 115,000 ft (35.0 km). The calibrated cells can now be used as reference standards in simulator testing of cells and arrays. Author

N86-19587# Membrane Technology and Research, Inc., Menlo Park, Calif.
NEW MEMBRANE PRECONCENTRATION DEVICES FOR TRACE VAPOR DETECTION SYSTEMS PHASE 1 Final Report
D. Armstrong, R. W. Baker, and J. Mohr 1985 23 p
(Contract DAAK70-84-C-0078)
(AD-A161042) Avail: NTIS HC A02/MF A01 CSCL 07/1

This report describes the results of a six month feasibility program to develop a membrane vapor concentration device. The device would be used to concentrate trace organic vapors in air prior to introduction to a detector instrument. In this way the complexity and cost of the instrumentation required to detect vapors emitted from hidden explosives could be reduced. The membrane concentrator involves the use of ultrathin silicone rubber composite membranes contained in a novel separation cell. Toluene was used as a model organic vapor for explosive vapors. The membrane system was able to obtain enrichments of as much as 50-fold with toluene at pressure ratios of less than 10 across the cell. However, the time to reach this degree of concentration was excessively long at 200 minutes. It appears that large amounts of the organic vapor are sorbed onto and into the membrane and adhesives of the membrane cell. It was not possible to overcome this sorption effect and reduce the system's lag time to a more useful value. Thus, this membrane concentration device does not appear to be a practical preconcentrator for a trace vapor detection instrument. GRA

N86-19588# Naval Postgraduate School, Monterey, Calif.
INITIAL DEVELOPMENT OF A LASER ALTIMETER M.S. Thesis
Joseph P. Gilio Sep. 1985 68 p
(AD-A161048) Avail: NTIS HC A04/MF A01 CSCL 14/2

A design study was carried out of a small, expendable, self-contained laser altimeter for overwater operation at low altitude. A .904 micrometer Gallium Arsenide laser was used to build a prototype transmitter/ receiver at a cost of less than $600 and small enough to fit inside a 5 inch diameter cylinder, 5 inches long. Tests at a height of 120 feet above the surface of a lake resulted in a signal-to-noise ratio of 6, and validated the trade-off equation used in this study. A second test model, with design improvements incorporated, is predicted to yield a SNR of over 20 for an altitude of 150 meters. GRA

N86-19589# Naval Postgraduate School, Monterey, Calif.
CONTROL SYSTEMS FOR A DUAL MOTOR HIGH SPEED MOTION PICTURE CAMERA M.S. Thesis
Edward Y. Brewster Sep. 1985 150 p
(AD-A161071) Avail: NTIS HC A07/MF A01 CSCL 14/5

This thesis studies the control of a dual motor high speed motion picture camera. This camera is a modification of the one motor cameras presently in use today. First the system model is developed and then the control system is examined for the ideal tachometer. Next, nonideal characteristics of the tachometer signal as derived from an optical tachometer are discussed. Included in this section is the need to have pretensioning prior to the filming and deceleration at the end of the filming. The remainder of the thesis examines phase locked loop techniques for speed control of the high speed camera. Author (GRA)

N86-19590# Harvard Univ., Cambridge, Mass.
SEQUENTIAL PROCESSES IN IMAGE GENERATION: AN OBJECTIVE MEASURE Technical Report, 1 Apr. - 31 Oct. 1985
Stephen M. Kosslyn, Carolyn B. Cave, and David A. Provost 31 Oct. 1985 66 p
(Contract N00014-85-K-0291)
(AD-A161200; TR-6) Avail: NTIS HC A04/MF A01 CSCL 05/10

Are visual mental images of objects created a part at a time? This paper reports an new objective technique that was developed to answer questions such as this one. The results of using this technique indicated that images of upper case letters are formed segment by segment, in roughly the order in which most people draw the letters. These results were shown not to be artifact of how people scan over images once they are formed, and could not have been due to experimenter-expectancy effects. In addition, the results indicated that subjective estimates of mental image generation time are quite close to those obtained using objective measures. GRA

N86-19591# Rochester Univ., N. Y.
PARAMETERS OF VARIOUS TYPES OF LIGHT GUIDES FOR LARGE AREA SCINTILLATION COUNTERS
C. P. Cheng and H. W. Zheng Aug. 1985 20 p Presented at the 12th International Symposium on Lepton and Photon Interactions At High Energies, Kyoto, Japan, 19 Aug. 1985 Prepared in cooperation with National Lab. for High Energy Physics, Oho, Japan
(Contract DE-AC02-76ER-13065)
(DE86-000638; DOE/ER-13065/429; CONF-850819-9) Avail: NTIS HC A02/MF A01

The properties of a variety of different light guides used in conjunction with a large area scintillator have been studied. The performance of a Y7 wavelength-shifter bar, a fishtail, a separated twisted and an all area coupled twisted lucite light guide were compared. Various parameters of the counters, including the number of photoelectrons, the detection efficiency, the attenuation length, the time resolution and the effective light velocity were measured. The detection efficiency for minimum ionizing particles is near 100% for each of the four types of light guides. The best performance was found for the all area coupled twisted guide. For this, we observe an average of 50 photoelectrons per minimum ionizing particle and a mean time resolution (sigma) of 0.4ns. The absorption length for scintillation light in Y7 was determined and a decay time spectrum consisting of two exponential components has been measured. A Monte Carlo simulation of photon transmission in the counters has been done; the measured results on the performance of the various counter configurations agree well with the predictions of the simulation. DOE

N86-19592# Department of the Army, Washington, D. C.
METHOD OF PROTECTING A RADIOCHROMIC OPTICAL WAVEGUIDE DOSIMETER FROM ADVERSE TEMPERATURE EFFECTS Patent Application
S. Kronenberg, inventor (to Army) (Department of the Army, Washington, D.C.) Filed 26 Sep. 1985 16 p
(AD-D011949; US-Patent-Appl-SN-780347) Avail: NTIS HC A02/MF A01 CSCL 06/18

A radiochromic optical waveguide dosimeter is protected from the adverse temperature effects of exposure in the desired operational temperature range of -40 C to +60 C by flattening the round plastic tubing to be used for the fabrication of the dosimeter until the tubing attains an elliptical cross section and then fabricating the dosimeter from the tubing having the elliptical cross section. Author (GRA)

N86-19593# Institut Franco-Allemand de Recherches, St. Louis (France).
MEASUREMENT OF THE LOCAL CONCENTRATION IN A CO2 FREE JET USING SPONTANEOUS RAMAN DIFFUSION [MEASURE DE LA CONCENTRATION LOCALE DANS UN JET LIBRE DE CO2 AU MOYEN DE LA DIFFUSION RAMAN SPONTANE]
L. Bobin and G. Brom 17 Sep. 1984 41 p refs In FRENCH Original contains color illustrations
(ISL-R-117/84) Avail: NTIS HC A03/MF A01

A laser Doppler velocimeter and a Raman diffusion measuring device were used simultaneously on a CO2 free jet discharging in air. The velocity profiles, the average concentrations and the turbulent fluctuations were measured. Local instantaneous flow was determined as well as the proportion of air in the flow. The air increases linearly with distance. For this case the air concentration increase is 25 % of the jet initial flow for a length increase equivalent to an initial diameter. Author (ESA)

N86-19594# Institut Franco-Allemand de Recherches, St. Louis (France).
UTILIZATION OF MICROCHANNEL PLATES IN X-RAY CRYSTALLOGRAPHY Final Report [VERWENDUNG VON MICROCHANNELPLATES IN DER ROENTGENKRISTALLOGRAPHIE]
T. Ebding 31 Dec. 1984 17 p refs In GERMAN
(Contract BMVg-T/R-760/E-0015/E-1715)
(ISL-R-124/84) Avail: NTIS HC A02/MF A01

An X-ray detector using a microchannel plate (MCP) was developed and utilized in X-ray crystallography. The tests show that this detector is more sensitive than a system scintillator-film, and that the main problem of scintillator and film, namely the possibly small distance to the sample for intensity reasons, does not occur with an MCP which detects the different X-ray quanta and has practically no dark current. This advantage is particularly interesting for X-ray crystallography on hollow-charge where the excited shock wave is susceptible to destroy a detector in the immediate vicinity. It is shown that image processing methods allow a better evaluation of the information available in the diagrams. The weak intensity line K beta 200, which is not visible with the eye on the X-ray image, is represented with the help of a computer. Author (ESA)

N86-19595# Unisearch Associates, Inc., Concord (Ontario).
INITIAL TESTING OF THE TUNABLE DIODE LASER ABSORPTION SPECTROMETER FOR MEASURING NO2 AND HNO3 IN DIESEL ENGINE EXHAUST Final Report
G. W. Harris, G. I. Mackay, and H. I. Schiff 1 Feb. 1985 52 p

(PB85-212967; CRC/APRAC/CAPE-30-81-04) Avail: NTIS HC A04/MF A01 CSCL 14B

The Unisearch tunable diode laser absorption spectrometer designed for tropospheric air monitoring (TAMS-2B) was used at the Ontario Research foundation Diesel Dynamometer test facility to make preliminary investigations on the ability of the TAMS-2B to make real time measurements of NO2 and HNO3 in diesel engine exhaust. The results indicated that the TAMS-2B was well suited to making such measurements so long as Teflon filters were employed to remove particles from the exhaust gas stream. The data indicate that at least part of this slow response was due to effects associated with the exhaust train and the dilution tunnel rather than with the TAMS2-B inlet system. GRA

N86-19629# Technische Hogeschool, Delft (Netherlands). Dept. of Applied Physics.
SENSORS: VISION AND TACTILE
Frans C. A. Groen and Piet W. Verbeek *In* AGARD Artificial Intelligence and Robotics Sep. 1985 17 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

N86-19631# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Electrical, Computer, and Systems Engineering.
THE SENSING AND DISPLAY OF THREE-DIMENSIONAL INFORMATION WITH EMPHASIS ON SOLID MODELLING: STATUS AND APPLICATIONS
Lester A. Gerhardt *In* AGARD Artificial Intelligence and Robotics Sep. 1985 8 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

N86-19842# Joint Publications Research Service, Arlington, Va.
MAGNETOCARDIOGRAPHY
A. Ruvinskiy *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 64-67 Transl. into ENGLISH from Leninskoye Znamya (Moscow, USSR), 21 Jul. 1985 p 4 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

36 LASERS AND MASERS

Includes parametric amplifiers.

N86-19596*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONG GAIN LENGTH SOLAR PUMPED BOX LASER Patent Application
Russell J. DeYoung, inventor (to NASA) Filed 18 Jun. 1985 9 p
(NASA-Case-LAR-13256-1; NAS 1.71:LAR-13256-1;
US-Patent-Appl-SN-745973) Avail: NTIS HC A02/MF A01 CSCL 20E

A solar pumped laser has its lasing path lengthened by forming a square loop in the lasing path by means of bending mirrors. Solar radiation is collected and concentrated into a donut shaped intensity pattern. This intensity pattern is directed onto the lasing path such that there is a maximum fit of the solar intensity pattern to the square loop laser cavity. NASA

N86-19597# Texas A&M Univ., College Station. Dept. of Physics.
VELOCITY RESOLVED SCATTERING OF ATOMIC HYDROGEN FROM SURFACES Final Report, 1 Aug. 1980 - 31 May 1985
E. S. Fry and D. G. Naugle 1 Oct. 1985 5 p
(Contract N00014-80-C-0806; RR0-1102)
(AD-A160888; ABL-1) Avail: NTIS HC A02/MF A01 CSCL 20/5

A stabilized single frequency cw Nd-YAG has been designed and built. It has been used to injection lock a high power pulsed Nd-YAG laser. The system has been used to produce ultraviolet tuneable, narrow linewidth radiation at 2430A. It is used for two photon excitation of atomic hydrogen. Applications of the latter are discussed, e.g. as a probe for studies of atom-surface scattering and of neutral hydrogen atom detection in fusion plasmas. GRA

N86-19598# Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Physics.
POTENTIAL VISIBLE CHEMICAL LASERS VIA INTERACTIONS OF SINGLET MOLECULAR OXYGEN WITH HEAVY METAL ATOMS AND OXIDES Final Report, 15 Mar. 1984 - 15 Mar. 1985
Rosenwaks Salman 5 Nov. 1985 18 p
(Grant AF-AFOSR-0087-84)
(AD-A161174; EOARD-TR-86-01) Avail: NTIS HC A02/MF A01 CSCL 20/5

The present research has been the first part of a continued effort to thoroughly study the kinetics and spectroscopy of the heavy-atoms/singlet oxygen mixtures. The measurements were conducted in a flowing afterflow reactor to which a metal evaporation furnace and a singlet oxygen generator are interfaced. The atoms studied so far were Pb and Bi. The results of the measurements show that significant electronic excitation of metal atoms, metal dimers and metal oxides can be obtained via multiple collisions with singlet molecular oxygen. Laser induced fluorescence measurements in Pb/O2 mixtures corroborates the mechanism for PbO formation previously suggested in this laboratory. Mechanisms for production of excited species in Bi/O2 are inferred from the dependence of the emission intensity from these species on (Bi) and (Bi2). In particular, it is suggested that the strong emission from Bi(2D3/2) must originate from energy transfer from O2(l sigma) which, in turn, is produced via multiple collisions of O2(l delta) with Bi2. The results of the present research are encouraging regarding the prospects of obtaining significant concentrations of atomic and molecular species via multiple collision with singlet molecular oxygen. Author (GRA)

N86-19599# Aerospace Corp., El Segundo, Calif.
KINETICS OF THE H2-NF2 SYSTEM
J. B. Koffend, Carrol E. Gardner, and Raymond F. Heifner, III 28 Sep. 1985 43 p
(Contract F04701-83-C-0084)
(AD-A161220; TR-0084A(9990)-2; SD-TR-85-55) Avail: NTIS HC A03/MF A01 CSCL 07/5

The reaction of hydrogen atoms with NF2 was studied in a flow tube using pulsed KrF laser initiation of H2/NF2/Ar mixtures at 440 K. The quantum yield for NF(a) production from the 249 nm photolysis of NF2 was determined to be 0.10 + or - 0.05. Several important reactions in this system were investigated, and rate coefficients were determined at 440 K. A value of (1.03 + or - 0.20) x 10 to the -30th power cm to the 6th power/sq. molecule -sec was obtained for the three-body recombination of F atoms with NF2 and Ar. Rate constants for the relaxation of HF(v = 2) and HF(v = 3) by NF2 are (9.7 + or - 1.0) x 10 to the -14th power and (2.5 + or - 0.5) x 10 to the -13th power cc/molecule-sec, respectively. Study of the quenching of NF(a) by NF2 yields a rate coefficient of (2.7 + or -1.0) x 10 to the -16th power cc/molecule-sec. Evidence is presented that indicates the disproportionation of NF(a) is three orders of magnitude slower than that of ground state NF. Modeling results are presented which agree well with experimental data. GRA

N86-19600# Lawrence Livermore National Lab., Calif.
SPECIFIC HEAT LOADING IN Nd:GLASS LASERS
W. F. Krupke Aug. 1985 20 p
(Contract W-7405-eng-48)
(DE86-002151; UCID-20531) Avail: NTIS HC A02/MF A01

The specific thermal load parameter, chi, for xenon flashlamp-pumped Nd:glass gain media is written as a function of neodymium concentration, pump pulse duration, and energy extraction efficiency. The currently available data on radiative and nonradiative decay probabilities of several commercial Nd:glasses are used to calculate and graph specific thermal load parameter values. By factoring these results into performance scaling relationships for zig-zag and disk lasers, specific Nd:glasses can be selected for optimized laser performance. DOE

N86-20063# Joint Publications Research Service, Arlington, Va.
THE MECHANISM UNDERLYING DESTRUCTION OF POLYMERS BY RADIATION FROM PULSE-PERIODIC CO2 LASER Abstract Only
G. G. Gladush, Ye. B. Levchenko, V. G. Nizev, and R. D. Seydgazov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 12 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 11, no. 11, Nov. 1984 p 2294-2300 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20064# Joint Publications Research Service, Arlington, Va.
FINDING AND DEVELOPING GALLIUM-GARNET ACTIVE LASER MEDIA Abstract Only
Ye. V. Zharikov, S. P. Kalitin, V. V. Laptev, A. A. Mayer, and V. V. Osiko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 14 Transl. into ENGLISH of Akademiya Nauk SSSR, Inst. Obshchey Fiziki, Fizika Tverdogo Tela, Laboratoriya Fiziki Tverdogo Tela (Moscow, USSR) p 1-28 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20065# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF STIMULATED MANDELSHTAM-BRILLOUIN SCATTERING OF FOCUSED BEAMS IN THE REPETITIVE-PULSE MODE Abstract Only
R. R. Buzyalis, A. S. Dementyev, and E. K. Kosenko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 May 1986 p 15 Transl. into ENGLISH from Litovskiy Fizicheskiy Sbornik (Vilnius, USSR), v. 25, no. 1, Jan. - Feb. 1985 p 68-79 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20066# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF AMPLIFICATION AND LASING SPECTRUM OF TEA-LASER EMPLOYING MIXTURE OF ISOTOPE-SUBSTITUTED CARBON DIOXIDE MOLECULES Abstract Only
V. O. Petukhov, N. N. Sazhina, V. S. Starovoytov, S. A. Trushin, N. V. Cheburkin, S. K. Chekin, and V. V. Churakov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 17 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 2, Feb. 1985 p 416-419 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20068# Joint Publications Research Service, Arlington, Va.
NONLINEAR ATTENUATION OF PULSED LASER RADIATION ALONG A NEAR-SURFACE ATMOSPHERIC PATH
N. A. Blinov, I. A. Leontyev, Ye. G. Ryzhkov, V. L. Semenov, V. P. Sinelnikov, S. S. Fillippov, and N. V. Cherburkin *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 33-36 refs Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 10, Oct. 1985 p 2147-2149 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N86-19601 Carnegie-Mellon Univ., Pittsburgh, Pa.
GRASPING AND THE MANIPULATION FOR AUTOMATED MANUFACTURING Ph.D. Thesis
Mark Robert Cutkosky 1985 182 p
Avail: Univ. Microfilms Order No. DA8513679

An instrumented, controllable wrist is presented for use with a large industrial robot. The wrist is designed for fine motions that require compliance or adaptation to an existing geometry. Experiments focus on tasks that require communication between the robot arm and wrist. The results suggest that it is still appropriate to treat the wrist and robot separately and to take advantage of the simplicity that a distributed control system affords. Before active robot hands can be put to use in the manufacturing environment, formidable problems in analysis and control must be resolved. A first step is to construct a mathematical model of an active gripper handling a tool or a workpiece. A method is presented for determining mechanical properties of a grasp and predicting how the grasp will behave in response to task-induced forces and motions. Dissert. Abstr.

N86-19602 Central Electricity Generating Board, London (England).
WELDING OF UNALLOYED/LOW-ALLOY STEEL TO AUSTENITIC STAINLESS STEEL, PART 2
14 Nov. 1985 16 p refs Transl. into ENGLISH from Hitsuastekniikka (Finland), no. 3, 1980 p 76-87
(BLL-CE-Trans-8219-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

The structural materials used for power station components comprise both ferritic low-alloy and austenitic high-alloy steels. The temperature above which the oxidation resistance and creep resistance of low-alloy Cr-Mo-steels are no longer adequate is approx. 530-550 C, depending on the working pressure. For components operating above this temperature, austenitic stainless steels are used, in which case welded joints must be made between dissimilar steels. Welding of low-alloy steels and austenitic stainless steels does not in itself create real problems. Problems have arisen due to reduced strength of the low-alloy steel caused by diffusion of carbon and thermal stresses which have developed between the weld seam and on the low-alloy steel, due to the different thermal expansion characteristics. This survey examines the manufacturing methods of the above welds in general, setting out experimental work on the characteristics of welds on an AISI 347 type steel and a heat resistant 2 1/4 Cr-Mo steel carried out at the metallurgical laboratory. B.W.

N86-19603* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS FOR ADAPTING AN END EFFECTOR DEVICE REMOTELY CONTROLLED MANIPULATOR ARM Patent
Keith H. Clark, inventor (to NASA) Issued 8 Oct. 1985 7 p Filed 30 Sep. 1983
(NASA-Case-MFS-25949-1; US-Patent-4,545,723;
US-Patent-Appl-SN-538063; US-Patent-Class-414-730;
US-Patent-Class-901-31; US-Patent-Class-901-50) Avail: US Patent and Trademark Office CSCL 13I

Apparatus for adapting a general purpose and effector device to a special purpose and effector is disclosed which includes an adapter bracket assembly which provides a mechanical and electrical interface between the end effector devices. The adapter bracket assembly includes an adapter connector post which interlocks with a diamond shaped gripping channel formed in closed jaws of the general purpose end effector. The angularly intersecting surfaces of the connector post and gripping channel prevent any relative movement there between. Containment webs constrain the outer finger plates of the general purpose jaws to prevent pitch motion. Electrical interface is provided by conical, self aligning electrical connector components carried by respective ones of said end effectors.
Official Gazette of the U.S. Patent and Trademark Office

N86-19604* National Aeronautics and Space Administration. Pasadena Office, Calif.
MEMORY METAL ACTUATOR Patent
Carl F. Ruoff, inventor (to NASA) (JPL, Pasadena, Calif.) Issued 19 Nov. 1985 7 p Filed 26 Aug. 1983 Sponsored by NASA
(NASA-Case-NPO-15960-1; US-Patent-4,553,393;
US-Patent-Appl-SN-527613; US-Patent-Class-60-528;
US-Patent-Class-60-527; US-Patent-Class-337-140) Avail: US Patent and Trademark Office CSCL 13I

A mechanical actuator can be constructed by employing a plurality of memory metal actuator elements in parallel to control the amount of actuating force. In order to facilitate direct control by digital control signals provided by a computer or the like, the

actuating elements may vary in stiffness according to a binary relationship. The cooling or reset time of the actuator elements can be reduced by employing Peltier junction cooling assemblies in the actuator.
Official Gazette of the U.S. Patent and Trademark Office

N86-19605* National Aeronautics and Space Administration. Pasadena Office, Calif.
JOINT FOR DEPLOYABLE STRUCTURES Patent
Norwood D. Craighead, II (JPL, Pasadena, Calif.), Richard J. Preliasco (JPL, Pasadena, Calif.), and Timothy D. Hult, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 17 Dec. 1985 6 p Sponsored by NASA
(NASA-Case-NPO-16038-1; US-Patent-4,558,967;
US-Patent-Appl-SN-469864; US-Patent-Class-403-113;
US-Patent-Class-403-120; US-Patent-Class-16-294) Avail: US Patent and Trademark Office

A joint is described for connecting a pair of beams to pivot them between positions in alignment or beside one another, which is of light weight and which operates in a controlled manner. The joint includes a pair of fittings and at least one center link having opposite ends pivotally connected to opposite fittings and having axes that pass through centerplates of the fittings. A control link having opposite ends pivotally connected to the different fittings controls their relative orientations, and a toggle assemly holds the fittings in the deployed configuration wherein they are aligned. The fittings have stops that lie on one side of the centerplane opposite the toggle assembly.
Official Gazette of the U.S. Patent and Trademark Office

N86-19606* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPLIANT HYDRODYNAMIC FLUID JOURNAL BEARING Patent
Edward L. Warren, inventor (to NASA) Issued 12 Nov. 1985 6 p Filed 24 Apr. 1984
(NASA-Case-LEW-13670-1; US-Patent-4,552,466;
US-Patent-Appl-SN-603374; US-Patent-Class-384-103;
US-Patent-Class-384-106) Avail: US Patent and Trademark Office

An air bearing structure is described that prevents destructive bending moments within the top foil. Welds are eliminated by mounting the top bearing foil in the bearing cartridge sleeve without using a space block. Tabs or pins at the end of the top bearing foil are restrained by slots or stops formed in the cartridge sleeve. These structural members are free to move in a direction normal to the shaft while being restrained from movement in the direction of shaft rotation.
Official Gazette of the U.S. Patent and Trademark Office

N86-19607 Alabama Univ., Huntsville.
A CREEP-RUPTURE MODEL FOR FILAMENT-WOUND SPHERICAL PRESSURE VESSELS Ph.D. Thesis
Jan Davis Dozier 1985 125 p
Avail: Univ. Microfilms Order No. DA8519061

The creep-rupture model is that of a quasi-isotropic filament-wound spherical pressure vessel subjected to sustained internal pressurization. As relaxation of the viscoelastic matrix material occurs, the circumferential strain increases, thus causing an increase in microcracks until a critical condition is attained. To account for this internal damage, relationships between increasing maximum circumferential strain and decreasing transverse modulus are defined. The elastic viscoelastic correspondence principle is employed: for a given magnitude of internal pressure, the associated elastic solution is obtained in closed form through the application of Laplace transformation. This solution is inverted back into the time domain by the multidata method to yield, after a certain number of iterations, the time-dependent maximum circumferential strain. Failure is based upon the maximum strain criterion. Dissert. Abstr.

N86-19608 Cornell Univ., Ithaca, N.Y.
TRAJECTORY CONTRCL AND OBSTACLE AVOIDANCE FOR ROBOT MANIPULATORS WITH BOUNDED INPUTS Ph.D. Thesis
1985 96 p
Avail: Univ. Microfilms Order No. DA8516953

A non-linear controller is developed in this thesis that considers the complete non-linear system dynamics. In addition, the control allows for bounds on the system inputs, such as limited input torque from the joint motors. The control is based upon the application of an Optimal Decision Strategy, a pointwise optimization process. This results in the design of the control being reduced to the solution of a quadratic programming problem at each sample point. The robustness of the control scheme to unmodeled dynamics is examined and a robust control is presented. A real-time implementation of this control is developed for a three degree of freedom robot manipulator. The control is implemented using 16 bit microprocessor and is programmed in a high level language. The manipulator dynamics are computed using the Euler-Lagrange formulation and the control system is run with a sample period of 16 milliseconds. Dissert. Abstr.

N86-19609 Michigan Univ., Ann Arbor.
THERMO-MECHANICAL CONTACT OF TWO SLIDING HALF-PLANES AND RELATED PROBLEMS Ph.D. Thesis
Alexander Azarkhin 1985 109 p
Avail: University Microfilms Order No. DA8520862

The present dissertation is submitted as a collection of four manuscripts. In the first two papers, the time dependent contact problem of a non-conducting half-plane sliding on the surface of a conductor with heat generation at the interface due to friction is studied. The conducting body is slightly rounded to give a Hertzian initial pressure distribution. One algorithm developed is based on the statement of the problem in terms of appropriate Green's functions. Numerical results show that, if the ratio of the initial size of the area of contact to that in the steady state is less than some critical value, the area of contact and the pressure distribution change smoothly toward the steady state. In the third paper, the partial contact of a thin-walled circular cylinder transmitting a longitudinal eccentrically applied force and a rigid half-space is studied. In the fourth paper, an algorithm is developed which reduces the problem of elastic stability for a complicated domain to a set of problems for simple subdomains. Dissert. Abstr.

N86-19610*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD FOR FORMING HERMETIC SEALS Patent Application
Brian D. Gallagher, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 15 Aug. 1985 15 p
(Contract NAS7-918)
(NASA-Case-NPO-16423-1-CU; NAS 1.71:NPO-16423-1-CU;
US-Patent-Appl-SN-765978) Avail: NTIS HC A02/MF A01 CSCL 11A

A firmly adherent film of bondable metal, such as silver, is applied to the surface of glass or other substrate by decomposing a layer of a solution of a thermally decomposable metallo-organic deposition (MOD) compound such as silver neodecanoate in xylene. The MOD compound thermally decomposes into metal and gaseous by-products. Sealing is accomplished by depositing a layer of bonding metal, such as solder or a brazing alloy, on the metal film and then forming an assembly with another high melting point metal surface such as a layer of Kovar. When the assembly is heated above the temperature of the solder, the solder flow wets the adjacent surfaces and forms a hermetic seal between the metal film and metal surface when the assembly cools. NASA

N86-19611*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DUAL MOTION VALVE WITH SINGLE MOTION INPUT Patent Application
Robert R. Belew, inventor (to NASA) Filed 3 Jul. 1985 17 p
(NASA-Case-MFS-28058-1; NAS 1:71:MFS-28058-1;
US-Patent-Appl-SN-751691) Avail: NTIS HC A02/MF A01 CSCL 13I

A dual motion valve (A) includes two dual motion valve assemblies with a rotary input which allows the benefits of applying both rotary and axial motion to a rotary sealing element with a plurality of ports. The motion of the rotary sealing element during actuation provides axial engagement of the rotary sealing element with a stationary valve plate which also has ports. Fluid passages are treated through the valve when the ports of the rotary sealing element are aligned with the ports of the stationary valve plate. Alignment is achieved through rotation of the rotary sealing element with respect to the stationary valve plate. The fluid passages provide direct paths which minimize fluid turbulence created in the fluid as it passes through the valve (A). NASA

N86-19612*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

UNIVERSAL CLAMP Patent Application

John P. Clancy, inventor (to NASA) (McDonnell-Douglas Corp., Houston, Tex.) Filed 23 Oct. 1985 16 p

(NASA-Case-MSC-20549-1; NAS 1.71:MSC-20549-1; US-Patent-Appl-SN-790596) Avail: NTIS HC A02/MF A01 CSCL 13I

A mechanical force actuator which is light weight and manipulatable and utilizes linear motion for push or pull forces is presented. The mechanical force producing mechanism comprises a linear actuator mechanism and a linear motion shaft mounted parallel to one another. The linear motion shaft is connected to a stationary or fixed housing and to a movable housing where the movable housing is mechanically actuated through actuator mechanism by either manual means or motor means. The housings are adapted to releasably receive a variety of jaw or pulling elements adapted for clamping or prying action. The stationary housing is adapted to be pivotally mounted to permit an angular position of the housing to allow the tool to adapt to skewed interfaces. The actuator mechanism is operated by through a gear train to obtain linear motion of the actuator mechanism. NASA

N86-19613*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PRELOADABLE VECTOR SENSITIVE LATCH Patent Application

William R. Acres, inventor (to NASA) Filed 3 Oct. 1985 21 p

(NASA-CASE-MSC-20910-1; NAS 1.71:MSC-20910-1; US-Patent-Appl-SN-783888) Avail: NTIS HC A02/MF A01 CSCL 13E

A preloadable vector-sensitive latch which automatically releases when the force vector from a latch member reaches a specified release angle is presented. In addition, it contains means to remove clearance between the latched members and to preload the latch to prevent separation at angles less than the specified release angle. The latch comprises a triangular main link, a free link connected between a first corner of the main link and a yoke member, a housing, and an actuator connected between the yoke member and the housing. A return spring bias means connects the main link to a portion of the housing. A second corner of the main link is slidably and pivotally connected to the housing via a slot in a web portion of the housing. The latch housing has a rigid docking ring alignable with a mating locking ring which is engageable by a locking roller journalled on the third corner of the triangular main link. NASA

N86-19614*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

APPARATUS AND METHOD OF CAPTURING AN ORBITING SATELLITE Patent Application

William D. Harwell and Dale A. Gardner, inventors (to NASA) Filed 7 Nov. 1985 24 p Div. of US-Patent-Appl-SN-132364, US-Patent-4,404,793, filed 20 Mar. 1980

(NASA-Case-MSC-20979-1; NAS 1.71:MSC-20979-1; US-Patent-Appl-SN-796053) Avail: NTIS HC A02/MF A01 CSCL 13E

Apparatus and method of capturing an orbiting spacecraft by attaching a grapple fixture are discussed. A probe is inserted into an opening, such as rocket nozzle, in the spacecraft until a stop on the probe mechanism contacts the spacecraft, a lever is actuated releasing a spring loaded rod which moves axially along the probe removing a covering sleeve to expose spring loaded toggle fingers which pivot open engaging the side of the opening. The probe is shortened and tensioned by turning a screw thread, pressing the fingers inside of the opening to compress the spacecraft between the toggle fingers and the stop. A grapple fixture attached to the probe, which is thus secured to the spacecraft, is engaged by appropriate retrieval means such as a remote manipulator arm. NASA

N86-19615# National Aerospace Lab., Tokyo (Japan).

THE PERFORMANCE OF A CRYOGENIC PUMP FOR THE TWO-PHASE FLOW CONDITION

Hitoshi Yamada, Mitsuo Watanabe, Satoshi Hasegawa, and Kenjiro Kamijo Aug. 1985 12 p refs In JAPANESE; ENGLISH summary

(NAL-TR-870; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

An experimental investigation was carried out in order to obtain the performance characteristics of a cryogenic pump under a two-phase flow condition. The experiment used an oxygen pump with an inducer and liquid nitrogen as the test fluid. The vapor volumetric fraction at the pump inlet was calculated with an assumption of a constant enthalpy process across an orifice which was used to generate the two-phase flow at the pump inlet. The results showed that the pump head rise did hardly decrease even when the vapor friction became about 40 percent at the pump inlet. The two-phase flow at the pump inlet was confirmed by a visual observation through a transparent plastic section. It was also found that the adiabatic efficiency for the two-phase flow provided a good agreement with the pump efficiency, which was determined by using torques, outlet flow rates and the pressure difference between the pump inlet and outlet. Author

N86-19616*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT ON INTERFERENCE FITS ON ROLLER BEARING FATIGUE LIFE

Harold H. Coe and Erwin V. Zaretsky Jan. 1986 24 p refs

(NASA-TM-87165; E-2516; NAS 1.15:87165) Avail: NTIS HC A02/MF A01 CSCL 13I

An analysis was performed to determine the effects of inner-ring speed and press fits on roller bearing fatigue life. The effects of the resultant hoop and radial stresses on the principal stresses were considered. The maximum shear stresses below the Hertzian contact were determined for different conditions of inner-ring speed and load, and were applied to a conventional roller bearing life analysis. The effect of mean stress was determined using Goodman diagram approach. Hoop stresses caused by press fits and centrifugal force can reduce bearing life by as much as 90 percent. Use of a Goodman diagram predicts life reductions of 20 to 30 percent. The depth of the maximum shear stress remains virtually unchanged. Author

N86-19617*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

UNIQUE VARIABLE POLARITY PLASMA ARC WELDING FOR SPACE SHUTTLE

R. J. Schwinghamer Oct. 1985 25 p refs

(NASA-TM-86536; NAS 1.15:86536) Avail: NTIS HC A02/MF A01 CSCL 13I

Since the introduction of the Plasma Arc Torch in 1955 and subsequent to the work at Boeing in the 1960's, significant improvements crucial to success have been made in the Variable Polarity Plasma Arc (VPPA) Process at the Marshall Space Flight Center. Several very important advantages to this process are given, and the genesis of PA welding, the genesis of VPPA welding, special equiment requirements, weld property development, results with other aluminum alloys, and the eventual successful VPPA transition to production operations are discussed. Author

N86-19618*# California Univ., Los Angeles. School of Engineering and Applied Science.

SEPARATOR PLUGS FOR LIQUID HELIUM
Jeffrey M. Lee, S. W. K. Yuan, W. A. Hepler, and T. H. K. Frederking
Oct. 1984 54 p refs
(Contract NCC2-305)
(NASA-CR-176545; NAS 1.26:176545; UCLA-ENG-8436) Avail: NTIS HC A04/MF A01 CSCL 11A

Work performed during Summer 1984 (from June to Sept. 30) in the area of porous media for use in low temperature applications is discussed. Recent applications are in the area of vapor - liquid phase separation, pumping based on the fountain effect and related subsystems. Areas of potential applications of the latter are outlined in supplementary work. Experimental data have been developed. The linear equations of the two-fluid model are inspected critically in the light of forced convection evidence reported recently. It is emphasized that the Darcy permeability is a unique throughput quantity in the porous media application areas whose use will permit meaningful comparisons of data not only in one lab but also within a group of labs doing porous plug studies. Author

N86-19619# California Univ., Berkeley. Dept. of Mechanical Engineering.
NORMAL AND OBLIQUE IMPACT OF CYLINDRO-CONICAL AND CYLINDRICAL PROJECTILES ON METALLIC PLATES Final Report, Jun. 1982 - Jan. 1984
W. Goldsmith and S. A. Finnegan Jun. 1985 115 p
(Contract DAAG29-80-K-0052)
(AD-A159686; AD-E900496; NWC-TP-6479) Avail: NTIS HC A06/MF A01 CSCL 19/4

An experimental program has been undertaken to study the phenomenon of both normal and oblique impact of cylindro-conical and cylindrical projectiles on metallic plates, a domain where almost no test data is available. Hard-steel strikers of 12.7-micrometer nominal diameter and either 60-degree conical or blunt tips and blunt soft aluminum cylinders of the same diameter were fired at 2024-0 aluminum targets with thicknesses from 1.78 to 25.4-micrometer and at both mild steel and medium carbon steel with thicknesses up to 19.05-micrometer. Initial velocities ranged from about 20 to 1025 m/s, achieved with the aid of a pneumatic cannon at low speeds and a powder gun in the upper velocity range. Initial target obliquity was varied from normal to 50 degrees. GRA

N86-19620# SRI International Corp., Menlo Park, Calif.
MODELING AND PLANNING ROBOTIC MANUFACTURING Final Report
Peter C. Cheeseman and William T. Park Mar. 1985 34 p
(Contract N00014-83-C-0649)
(AD-A161014; AD-F620003) Avail: NTIS HC A03/MF A01 CSCL 13/8

EXPLAN is a general-purpose automatic control system that uses domain-specific knowledge to guide its choices at every step. EXPLAN was debugged using an extended blocks world domain, which is a simplification of typical robot pick-and-place operations. EXPLAN is based on a new knowledge representation that associates a symbolic time interval and a truth value of true or false with every proposition about the world. As it builds a plan, EXPLAN uses these truth values and time intervals to discover all harmful interactions that could occur between parallel actions and to order these actions to remove potential conflicts. EXPLAN uses this explicit representation of truth values and time intervals to describe preconditions for actions, as well as the actions themselves. This allows EXPLAN to reason efficiently about temporal relationships that occur during planning. This is a different approach from that used with state-change operator representations, which are the basis of many other artificial intelligence (A1) planning systems. GRA

N86-19621# Brunswick Corp., Lincoln, Nebr. Defense Div.
FEASIBILITY STUDY ON THE DESIGN OF REINFORCED PLASTIC COMPONENTS FOR THE LVTP (7) VEHICLE SHAFTS Final Report, May - Dec. 1984 on Phase 1
Jim McGee, Brian Spencer, and David Shy Dec. 1984 114 p
(Contract DAAG46-83-C-0025; DA Proj. 1L1-62105-AH-84)
(AD-A161024; AMMRC-TR-84-27) Avail: NTIS HC A06/MF A01 CSCL 13/6

This document pertains to a feasibility study in the design and manufacture of a composite drive shaft and propeller shaft for the LVTP (7) amphibious vehicle. The report shaft contains an analysis of the present steel shaft design and the two design approaches to a composite drive shaft. The first is a two piece drive shaft; the second is a combined single drive shaft eliminating several other parts. The design section includes the design of a joint to interface between the steel couplings and the composite shaft. The second part of this study is a manufacturing analysis of the production of 2,000 shafts for the actual retrofitting of the vehicle. It includes individual sections on fabrication, machining, and assembly of the proposed composite drive shaft. GRA

N86-19622# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
REDUNDANT SENSORS FOR MOBILE ROBOT NAVIGATION
Anita M. Flynn Sep. 1985 68 p
(Contract N00014-80-C-0505)
(AD-A161087; AI-TR-859) Avail: NTIS HC A04/MF A01 CSCL 17/7

Redundant sensors are needed on a mobile robot so that the accuracy with which it perceives its surroundings can be increased. Sonar and infrared sensors are used here in tandem, each compensating for deficiencies in the other. The robot combines the data from both sensors to build a representation which is more accurate than if either sensor were used alone. Another representation, the curvature primal sketch, is extracted from this perceived workspace and is used as the input to two path planning programs: one based on configuration space and one based on a generalized cone formulation of free space. (Author). GRA

N86-19623# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
PROCEEDINGS OF THE ISTVS (INTERNATIONAL SOCIETY FOR TERRAIN-VEHICLE SYSTEMS) WORKSHOP ON MEASUREMENT AND EVALUATION OF TIRE PERFORMANCE UNDER WINTER CONDITIONS, ALTA, UTAH, 11-14 APRIL 1983
George L. Blaisdell and Raymond N. Yong Sep. 1985 183 p
Workshop held at Alta, Utah, 11-14 Apr. 1983
(AD-A161129; CRREL-SR-85-15) Avail: NTIS HC A09/MF A01 CSCL 13/6

The problem of specification of required tire performance characteristics for operation in off-road situations can be a simple or complicated circumstance--depending on the sets of perspectives that are brought to bear in the evaluation of tire performance. The more detailed an individual is in specification or performance, the more complicated the issue becomes; primarily because the means for evaluation of performance cannot always be rigorously or exactly stated and because: (1) proper first evaluation of tires requires actual on-terrain running interaction; (2) test terrain variabilities cannot be readily described; and (3) test measurement systems and techniques, have yet to be fully delineated and rationalized, we are left with the situation of developing whole sets of procedures and standards that need to be continually upgraded or fine-tuned as more information becomes available. GRA

N86-19624# MMR Technologies, Inc., Mountain View, Calif.
DEVELOPMENT OF A LOW NOISE 10K REFRIGERATION SYSTEM Progress Report
Oct. 1985 21 p
(Contract N00014-85-C-0428)
(AD-A161199) Avail: NTIS HC A02/MF A01 CSCL 13/1

The purpose of this contract is the development of a Low Noise, Closed Cycle, Joule Thomson refrigeration system for 10K operation. This report summarizes work completed to date on the detailed thermodynamic analysis and physical design of the refrigerator. A complete enthalpy balance for the three stage device is presented. Fabrication of the first two refrigeration stages (argon and hydrogen) has begun. A prototype compressor for single gas operation has been designed and tested successfully. GRA

N86-19625*# Army Construction Engineering Research Lab., Champaign, Ill.
ADAPTIVE IDENTIFICATION AND CONTROL OF HVAC (HEATING, VENTILATING, AND AIR-CONDITIONING) SYSTEMS Final Report
Richard L. Bishop Sep. 1985 49 p
(Contract DE-AI02-83CE-30802; DA Proj. 4A1-61102-AT-23)
(AD-A161203; CERL-TR-E-85/08) Avail: NTIS HC A03/MF A01 CSCL 13/1

This report outlines the specialization of modern adaptive control theory to the control of heating, ventilation, and air-conditioning systems as a whole. Several technical aspects of this theory have been developed: preliminary filtration of data, time-optimal control, appropriate estimation of derivatives, novel test inputs, and a sequential UD algorithm. A form of time-optimal control has been found to be a good alternative to adaptive proportional-integral control, and a suggested implementation has been provided. GRA

N86-19626# Renault Vehicles Industriels (France). Direction Etudes et Recherches.
INDUSTRIAL SIMULATION AND MODELING. MODELING AND IDENTIFICATION OF TRANSIENT RESPONSES OF A TURBO-CHARGED DIESEL ENGINE FOR TRANSFER FUNCTION EVALUATION
Bernard Garaudee Feb. 1985 20 p
Avail: NTIS HC A02/MF A01

An identification, simulation, and control procedure which gives digital computers and modeling a major role in industrial applications of identification and control theory is described. Starting from an experimental design used to study an arbitrary unknown system, the procedure includes model structure determination, parameter estimation, model validation with feedback to model structure, and final model acceptance. The case of a diesel engine is detailed. The multiple input multiple output model includes the use of Kalman filter equations. Good agreement between predicted and experimental transient behavior is shown. Author (ESA)

N86-19627# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Avionics Panel.
ARTIFICIAL INTELLIGENCE AND ROBOTICS
Loughton, England Sep. 1985 141 p refs Lecture series held in Trondheim, Norway, 26-27 Sep. 1985, in The Hague, Netherlands, 30 Sep. - 1 Oct. 1985, and in Lisbon, Portugal, 3-4 Oct. 1985
(AGARD-LS-142; ISBN-92-835-1511-0) Avail: NTIS HC A07/MF A01

The renewed interest in the allied fields of Robotics and Artificial Intelligence is addressed. Both of these areas are studied with emphasis on robotics, beginning witth a review of the state-of-the-art and concluding with applications and a view of the future for each. Selected specialized subjects covered include vision and tactile sensors, robotics software, solid modelling, and expert systems. For individual titles, see N86-19628 through N86-19635.

N86-19628# National Bureau of Standards, Washington, D.C.
ROBOTICS: PAST, PRESENT, AND FUTURE
James S. Albus *In* AGARD Artificial Intelligence and Robotics Sep. 1985 16 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

Robotics is a systems science that attempts to integrate artificial intelligence with feedback control of mechanical devices. It draws on work in pattern recognition, scene analysis, geometrical reasoning, world modeling, language and speech understanding, planning, problem solving, goal seeking, task decomposition, manipulator control, mobility, and navigation. A brief history is given. A brief history of robotics is presented the following current research topics are examined: (1) kinematics, dynamics, and mobility; (2) vision, kinesthetic, tactile, and acoustic sensing and sensory processing; (3)sensory-interactive task decomposition, planning, and problem solving; (4) world modeling; (5) programming techniques and learning; and (6) system integration. Future applications are discussed. Author

N86-19629# Technische Hogeschool, Delft (Netherlands). Dept. of Applied Physics.
SENSORS: VISION AND TACTILE **c35**
Frans C. A. Groen and Piet W. Verbeek *In* AGARD Artificial Intelligence and Robotics Sep. 1985 17 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

Several techniques are presented to obtain 2D grey-value images and distance images. In these sensor systems different principles may be used to select the image points of which the grey-value is measured. The scanning may be presented in the light source, in the sensor, in the movement of the object or in a combination of these. Distance images may be obtained by triangulation of points in the scene between lightbeam and sensor. The sensors are based on scanning beams, planes of light or space encoding. Commonly used vision sensors such as video pick-up tubes, CCD arrays and Position Sensitive Detectors (PSD) are discussed. Tactile sensors are based on the measurement of surface deformation by optoelectronic, capacitive, magnetic, piezoelectric or piezoresistive transduction. Tactile arrays offer the possibility of obtaining pressure images which can be processed in the same way as if they are the result of a vision sensor. Author

N86-19630# Lehigh Univ., Bethlehem, Pa. Inst. for Robotics.
ROBOT SOFTWARE: CURRENT STATE-OF-THE-ART, AND FUTURE CHALLENGES **c61**
Roger N. Nagel and Scott R. Garrigan *In* AGARD Artificial Intelligence and Robotics Sep. 1985 9 p (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

Robot software system and their complexity currently are growing at an incredible rate. A complexity hierarchy covering the simplest methods of robot programming up through first and second generation robot programming languages is defined. Methods of graphical robot programming are described, and an assessment is made of the current state of the art of robotic software systems. The next generation of robot software systems which will be task level languages is described. That is, the elements of the programming language will be statements of tasks to be accomplished rather than statements with regard to robot motions. Technical challenges in achieving task level languages and current research approaches to overcoming these challenges are also described. Author

N86-19631# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Electrical, Computer, and Systems Engineering.
THE SENSING AND DISPLAY OF THREE-DIMENSIONAL INFORMATION WITH EMPHASIS ON SOLID MODELLING: STATUS AND APPLICATIONS **c35**
Lester A. Gerhardt *In* AGARD Artificial Intelligence and Robotics Sep. 1985 8 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

The sensing of three dimensional information is addressed, the display/representation of three dimensional information is considered. With respect to the sensing of three dimensional information, a variety of approaches are discussed including the use of structured light, the use of displaced sensors to develop stereo pairs, and coherence processing and time of flight measurement. Other techniques described are interpretation of object motion as a measurement of depth perception, and general methods for utilizing depth of field. The advantages and disadvantages of each are discussed and comparisons made. Three dimensional display techniques is also discussed. The appraoches covered include graphics, stereo pairs, holograms, vibrating mirrors, and other optical systems. Applications are reviewed with examples of results such as the use of vibrating mirror technology for the three dimensional display of compterized tomography. Solid modelling as an approach to the display and representation of

three dimensional information is reviewed. Following a definition of solid modelling, the advantages of this generic approach are reviewed and analyzed. The relationship of solid modelling to robotics and artificial intelligence is made, and trends cited with respect to hardware costs, portability of software, computational efficiency, display resolution, and neutral data bases. The paper concludes by giving examples of some of the key applications of solid modelling in the automative industry, aircraft industry and CAM, among others. Author

N86-19632# IBM United Kingdom Labs. Ltd., Winchester, (England).
CRT INSTALL AND SECURE STATIONS FOR THE GENERIC MONITOR LINE
D. C. Teale *In* AGARD Artificial Intelligence and Robotics Sep. 1985 9 p (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

Illustrations of the product from an assembly point of view are presented. Briefly shown are the problems were expected and where these stations fit in the line. How the station was designed is discussed from a generic automation viewpoint, highlighting the areas which are common to most automation stations. The work in the CRT install is used to illustrate the various stages of automation design, with particular emphasis on the areas which are common to all automation stations. The problems which were experienced in working with a PMC group located remotely from the laboratory is covered along the various differences in national standards which must be solved in order to attain two identical lines. Author

N86-19633# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Inst. fuer Dynamik der Flugsysteme.
SENSORY FEEDBACK STRUCTURES IN ROBOTICS
G. Hirzinger *In* AGARD Artificial Intelligence and Robotics Sep. 1985 15 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

The problems when trying to feed back on-line sensory signals in a robot control system are outlined. Special emphasis is laid on the question how to teach a robot a sensor-based task that must be repeated under changing environment. Feedback structures as they have proposed in literature especially for force-feedback are discussed. Generalizing definitions relating positions/orientations and (pseudo)-forces/torques are introduced. Sensor programming concept is outlined that refines any rudimentary robot command given by a human teacher or a CAD system via the sensory reaction with the environment. In this scheme motion commands and sensor data are stored together. The sensor data are then available as reference values for the repetition mode in a possibly changing environment. Techniques for teacher induced on-line improvements as well as self improvements of the robot are presented. The sensor-ball technique or programming robots is outlined as a special realization of these concepts. Author

N86-19634# Royal Signals and Radar Establishment, Malvern (England). Integrated Air Defence Systems Div.
APPLICATIONS OF EXPERT SYSTEMS c63
Philip R. Wetherall *In* AGARD Artificial Intelligence and Robotics Sep. 1985 17 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

An Expert System contains a knowledge base, an inference engine, an explanation system, a model of the real world and a man machine interface. The types of reasoning include interpretation, monitoring, prediction and design, together with specializations of these, such as diagnosis and planning, and aggregations, such as debugging, instruction and control. A range of possible applications are described to illustrate these general tasks. The nature of the knowledge available, and some implementation problems, are identified. The applications include examples in the area of tactical decision aids, specifically sensor data interpretation, data fusion, threat assessment and resource allocation. Other topics include cockpit environments and intelligent tutoring. Finally, some of the problems that limit the immediate widespread adoption of the technology are discussed. Author

N86-19635# George Mason Univ., Fairfax, Va.
APPLYING AI TO THE DIAGNOSIS OF COMPLEX SYSTEM FAILURES c63
Kenneth DeJong *In* AGARD Artificial Intelligence and Robotics Sep. 1985 4 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

The expert system technology from the artificial intelligence (AI) community is being applied to a wide variety of problems including fault isolation in complex man made systems. The use of expert systems was explored in the automatic test equipment (ATE) area (with particular interest in applications to Navy avionics gear). Several protype expert systems were built and discarded in the process of understanding how this technology can be usefully applied in the ATE world. The current views on these issues are summarized and an overview of the architecture of our latest prototype is required. Author

N86-20237# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL OF PLANETARY ROVER MOVEMENT Abstract Only
Ye. I. Grigoryev and S. N. Yermakov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 130-131 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 92-99 Original language document was announced in IAA as A85-25334 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N86-19636*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONDESTRUCTIVE TECHNIQUES FOR CHARACTERIZING MECHANICAL PROPERTIES OF STRUCTURAL MATERIALS: AN OVERVIEW
Alex Vary and Stanley J. Klima Dec. 1985 21 p refs Proposed for presentation at the 31st International Gas Turbine Conference, Dusseldorf, West Germany, 8-12 Jun. 1986; sponsored by ASME (NASA-TM-87203; E-2858; NAS 1.15:87203) Avail: NTIS HC A02/MF A01 CSCL 14D

An overview of nondestructive evaluation (NDE) is presented to indicate the availability and application potentials of techniques for quantitative characterization of the mechanical properties of structural materials. The purpose is to review NDE techniques that go beyond the usual emphasis on flaw detection and characterization. Discussed are current and emerging NDE techniques that can verify and monitor entrinsic properties (e.g., tensile, shear, and yield strengths; fracture toughness, hardness, ductility; elastic moduli) and underlying microstructural and morphological factors. Most of the techniques described are, at present, neither widely applied nor widely accepted in commerce and industry because they are still emerging from the laboratory. The limitations of the techniques may be overcome by advances in applications research and instrumentation technology and perhaps by accommodations for their use in the design of structural parts. Author

N86-19637# Rockwell International Corp., Richland, Wash.
SIMULATION OF GLOVEBOX NONDESTRUCTIVE ASSAY TO AID IN ERROR ESTIMATION AND MEASUREMENT PROCEDURE DESIGN
R. F. Eggers, E. W. Giese, R. A. Jones, and R. E. Kerns 19 Jul. 1985 8 p Presented at the 26th Annual Meeting of the Institute

of Nuclear Material Management, Albuquerque, N. Mex., 21 Jul. 1985
(Contract DE-AC06-77RL-01030)
(DE85-017242; RHO-SS-SA-18P; CONF-850765-33) Avail: NTIS HC A02/MF A01

Gamma ray nondestructive assay (NDA) measurement procedures for large objects such as gloveboxes require that multiple measurements be made to cover the entire object. Net counts observed at each measurement location are converted to special nuclear material (SNM) equivalents using a data reduction equation. To facilitate rapid and reliable reduction of data, this equation is often a simple representation of the measurement situation. Using a single measurement procedure applied uniformly to many situations and a simple data reduction equation produce results that only approximate the quantity of SNM contained in the glovebox. This paper discusses a glovebox measurement simulation model and computer program that is being developed by Rockwell Hanford Operations. The model is being used to investigate some of the errors associated with current measurement and data reduction procedures. DOE

N86-19638# Technische Hogeschool, Delft (Netherlands). Dept. of Mechanical Engineering.
DEVELOPMENTS IN QUALITY CONTROL [DE ONTWIKKELING VAN DE KWALITEITSBEHEERSING]
M. A. A. Kooter 31 Oct. 1983 51 p refs In DUTCH
(Rept-186) Avail: NTIS HC A04/MF A01

Developments of quality control and in particular the role of workers and quality managers in it, were surveyed. An increase in demands for quality from the outside (market shift), preventive quality care efficiency, and employee requests for more responsibility are discerned. A motivation improvement by decentralization, consciousness awakening, participation, and self-(quality)control in the production sector is pursued. Quality section tasks are shifted to the control and support of this self-control. Results are cost reduction and product improvement. Certification as a result of acknowledged quality control consolidates competitivity.
Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N86-19639 Illinois Univ., Urbana-Champaign.
SYMMETRY, BIFURCATION AND COMPUTATIONAL METHODS IN NONLINEAR STRUCTURAL MECHANICS Ph.D. Thesis
Timothy James Healey 1985 321 p
Avail: Univ. Microfilms Order No. DA8511616

The computation of global (equilibrium) solution branches of one-parameter systems arising in nonlinear structural mechanics is considered in this work. Particular emphasis is given to systems possessing spatial symmetry and to the expoitation of that symmetry in computational schemes. Strategies for accurately locating and classifying singular points, and methods for continuation through limit points and bifurcation points are presented. The techniques allow for branch switching at simple and multiple bifurcation points. The equilibirum equations of general nonlinearly elastic structures and solids possessing symmetry are shown to be covariant with respect to a specific set of linear transformations. These transformations form a group and are derived from the symmetry of the physical system. It is shown that the identification of covariance leads to a reduction in the original problem. Moreover, the group transformations can be used to generate new solution branches from known ones. Dissert. Abstr.

N86-19640 Virginia Polytechnic Inst. and State Univ., Blacksburg.
GEOMETRICALLY NONLINEAR FINITE ELEMENT ANALYSIS OF SPACE FRAMES Ph.D. Thesis
Jih Jih Jau 1985 272 p
Avail: Univ. Microfilms Order No. DA8511942

The displacement method of the finite element is adopted. Both the updated Lagrangian formulation and total Lagrangian formulation of a three-dimensional beam element is employed for large displacement and large rotation, but small strain analysis. A beam-column element or finite element can be used to model geometrically nonlinear behavior of space frames. The two element models are compared on the basis of their efficiency, accuracy, economy and limitations. An iterative approach, either Newton-Raphson iteration or modified Riks/Wempner iteration, is employed to trace the nonlinear equilibrium path. The latter can be used to perform postbuckling analysis. Dissert. Abstr.

N86-19641 Ohio State Univ., Columbus.
VIBRATION AND BUCKLING OF LAMINATED COMPOSITE PLATES WITH ARBITRARY BOUNDARY CONDITIONS Ph.D. Thesis
Benham Baharlou 1985 151 p
Avail: Univ. Microfilms Order No. DA8518914

Laminated composite plates are widely used at the present because of their any significant advantages and the problem of vibration and buckling of these structural elements has attracted the attention of many researchers over the last two decades. In this study an accurate and economical analytical approach is developed to find natural frequencies and buckling loads for all the possible combinations of the geometric boundary conditions that exist for a rectangular laminated composite plate. The Ritz method is used with ordinary algebraic polynomials as displacement functions. These polynomials are modified such that they satisfy the geometric boundary conditions, as is required by the Ritz method. The formulation done within the limitations of the classical theory of thin laminated plates for a general case of unsymmetric laminate. The numerical results calculated are compared with the ones available in the literature and solutions are found for a number of previously unsolved problems. Dissert. Abstr.

N86-19642 Engineering Sciences Data Unit, London (England).
GROWTH OF CRACKS UNDER CONSTANT AMPLITUDE FATIGUE LOADING: EXAMPLE CALCULATIONS
Mar. 1985 19 p ref Submitted for publication Sponsored in part by the Royal Aeronautical Society, London, England
(ESDU-84001; ISBN-0-85679-464-3; ISSN-0141-3996) Avail: ESDU

ESDU 84001 shows how crack growth data, such as those in this Sub-series, are used in practical situations; it provides two fully-worked examples using representative structural components to estimate the number of cycles to a specified crack length. The example shows the effect of a series of equally pitched riveted stiffeners on the progress of a crack across a sheet. Author

N86-19643 Engineering Sciences Data Unit, London (England).
CYLINDER GROUPS: MEAN FORCES ON PAIRS OF LONG CIRCULAR CYLINDERS
Aug. 1984 36 p refs
(ESDU-84015; ISBN-0-85679-477-5; ISSN-0141-4003) Avail: ESDU

ESDU 84015 provides a graphical method for predicting the drag and lift (that is, crosswind force) on each of a pair of closely spaced equal diameter cylinders having their axes parallel and normal to the flow. The method was derived from a correlation of experimental results extracted from the literature and applies to spacings between the axes in the range from one (cylinders touching) to 50 diameters for a range of incidences of 0 to 90 degrees (that is for cylinders in tandem round to cylinders side-by-side). The cylinders can be smooth up to moderately rough, and the Reynolds number range is from 10,000 to 10,000,000. The data can be used for pairs of pipes, cables, masts, or cylindrical structural members directly, and, using correction factors for finite length and shear flow effects in ESDU 81017, can also be applied to stacks and towers. Also included are descriptions of the flow mechanisms, caused by inteference between the flows around

the cylinders, which lead to the forces on the cylinders differing from those on an isolated cylinders. ESDU

N86-19644 New South Wales Univ., Sydney (Australia). School of Civil Engineering.
NONLINEAR AND TIME-DEPENDENT BEHAVIOUR OF REINFORCED CONCRETE SKELETAL STRUCTURES Ph.D. Thesis Abstract Only
S. L. Bakoss Apr. 1985 3 p
Avail: Issuing Activity

Long-term static tests were carried out on simply supported beams, continuous beams and rectangular closed frames. The test specimens, which were prototype-size, were made out of normal weight production grade ready-mixed concrete and utilized standard structural grade deformed reinforcement. The specimen were either subjected of constant sustained loads, in the service load range or were left unloaded to act as companion shrinkage specimens. The instantaneous and time-dependent reflections were recorded, together with the time-varying strain distribution at selected cross sections. For the continuous beams the redistribution of bending moments due to creep and shrinkage were also recorded. Ancillary material tests were carried out to determine the material properties required for the prediction of structural behavior. Author

N86-19645 Central Electricity Generating Board, London (England).
CREEP STRENGTH TESTING OF WELDED PIPE JOINTS OF THE 13 CrMo 4 4 AND 10 CrMo 9 10 STEELS
E. Jahn 14 Nov. 1985 32 p Transl. into ENGLISH from Mitteilungen der VGB (West Germany), v. 52, no. 3, Jun. 1972 p 258-270
(BLL-CE-Trans-8129-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

According to the technical regulations for steam generators joint welds in pipes of the 13 CrMo 4 4 and 10 CrMo 9 10 steels had originally been subjected to heat treatment regardless of the pipe sizes. The objective of this research was to investigate if and under what circumstances annealing treatment could be omitted. Creep strength was considered to be an important criterion, and therefore relevant tests were carried out on both steels. Gas fusion welded pipes were tested under uniaxial tensile stress in comparison with pipes under internal pressure, both in the unannealed and in the heat treated condition. For comparison, several unwelded specimens of the 10 CrMo 9 10 steel were tested which had, however, been annealed to simulate a comparable structure. It was necessary for the assessment of the importance of varying properties of these unannealed welds to carry out random tests on pipe welds of chromium-free 15 Mo 3 steel where annealing had never been required up to a wall thickness of 30 mm. Long-term annealing without stressing was carried out at the same time so that the change in hardness of these welds over a period of time could be determined. Author

N86-19646# Defence Research Information Centre, Orpington (England).
INFLUENCE OF INITIAL RESIDUAL STRESS ON FATIGUE CRACK PROPAGATION
S. Takezono (Kumamoto Univ., Japan), M. Sato (Mitsubishi Heavy Industries, Ltd., Japan), and K. Takita Oct. 1985 19 p refs Transl. into ENGLISH from Zairyo (Japan), v. 32, no. 361, 1983 p 1150-1156
(BLL-DRIC-Trans-7578-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.

The fatigue crack propagation behavior of S35C steel plate affected by initial residual stress has been investigated. Fatigue crack propagation tests under constant stress intensity factor range delta K have been conducted and the infuence of initial residual stress on crack propagation examined. Initial residual stress has been applied to testpieces in the form of pure bending. A FEM elastic-plastic analysis of fatigue crack growth has been performed, relationships with mechanical quantities calculated from the analysis, and crack propagation rate discussed. Author

N86-19647 British Library Lending Div., Boston Spa (England).
NEW EVALUATION METHOD FOR THE FATIGUE STRENGTH OF WELDED JOINTS
O. Sunamato, S. Yamauchi, and M. Matoba Nov. 1985 35 p refs Transl. into ENGLISH from Mitsubishi Jugyo Giho (Japan), v. 16, no. 3, 1979 p 283-291
(BLL-Risley-Tr-5235-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

A method in which the stress generated in the welded joint is effectively broken down into a nominal stress sigma(n), a secondary stress sigma(s) and a peak stress sigma(p) has been proposed for the estimation of fatigue limits. The peak stress is the stress which is concentrated in the vary narrow range of the toe, corresponding to the state of the toe part of the weld bead, and it can be evaluated with the fatigue notch coefficient K sub f which is based on data for basic welded joints. The secondary stress is the additional stress which is generated by the overall form of the joint structure, being represented by the secondary stress coefficient K sub s obtained by taking its ratio with the nominal stress. It can be evaluated with a reverse analysis from existing joint data, actual material data or by using a detailed finite element method analysis. The method has been proved for two sets of experimental values and the usefulness of the method has been confirmed. Fracture dynamics studies show that it is possible to evaluate life expectancies by carrying out fatigue crack growth calculations on the assumption that initial equivalent cracks are present in the toe part of the bead. It should be possible to estimate fatigue S-N diagrams for subject joint structures on the desk top if the estimations for both the fatigue limits and life expectancies are combined. M.G.

N86-19648 Illinois Univ., Urbana.
NUMERICAL ANALYSIS OF A GENERALIZED THREE-DIMENSIONAL ELASTICA Ph.D. Thesis
Wen-Ben Chou 1985 110 p
Avail: Univ. Microfilms Order No. DA8521744

A straightforward approximate procedure based on large deflections and rotations but with small strains is developed for the static analysis of a spatial elastica (a three-dimensional elastic thin rod). The rod is divided into finite elements with rotations treated as matrix transformations on vectors. The equilibrium positions, internal loads, and external support forces and moments of the elastica are determined for prescribed arbitrary conservative external loads and temperature differences. Half of the end boundary values, namely, six of the generalized forces and displacements at each end are prescribed. Following initial guesses for the remaining boundary values at one end of the rod, a sequential (chain) calculation is performed on the deformation and equilibrium of each element. A Newton-type iteration is used for improved guesses to be used in the next chain calculation. The iteration is said to converge when boundary values obtained from the chain calculation agree within acceptable error with the prescribed boundary values. Dissert. Abstr.

N86-19649 Cornell Univ., Ithaca, N.Y.
ANALYSIS OF STEADY STATE CRACK PROPAGATION DUCTILE MATERIALS Ph.D. Thesis
Kuang-Chong Wu 1985 157 p
Avail: Univ. Microfilms Order No. DA8516923

An analysis is presented for the steady state crack propagation in ductile materials. The analysis is made on the basis of the theory of crack extension rates for ductile materials proposed by Hart. The work done by Hart for Mode 3 cracks is expanded. The treatment is extended to Model 1 and Mode 2 cracks. Integral representations of stress equilibrium for all three loading modes are delivered by the method of fictitious body force. The stress equations consist of three terms. The first term is the applied stress represented by the elastic singular stress under the small scale yielding assumption. The second term is the self-stress induced by the plastic flow in the creep zone and the third term is a residual stress due to the accumulated plastic strain in the wake. It is shown that the local stress intensity factor K can be distinguished from the applied stress intensity factor K sub A by a

quantity K sup p that characterizes the stress relief effect of the plastic flow. The equations of energy balance of the crack systems are derived by employing the J-integral. Dissert. Abstr.

N86-19650 Wisconsin Univ., Madison.
TRANSIENT RESPONSE OF A TRANSVERSELY ISOTROPIC CYLINDRICAL SHELL WITH TEMPERATURE-DEPENDENT PROPERTIES Ph.D. Thesis
Yi-Syin Wang 1985 147 p
Avail: Univ. Microfilms Order No. DA8513490

The mechanical vibration of structural components can be caused when high energy is deposited in a very short interval of time. The vibration occurs because the temperature of the structural component can rise faster than the body can respond by thermal expansion under such conditions of rapid heating. In this paper, using the fundamental differential equations for the thermoelasticity of a thin cylindrical shell with finite length, the dynamic response of the shell subjected to volumetric and surface heat sources has been investigated. As the thermal shocks are expected to become significant the inertia terms have been taken into account in the study. The axisymmetric heat source is assumed to be instantly applied at an initial state and immediately afterwards cooled naturally. The physical reality of the influence of temperature upon the basic response characteristics of the material has been evaluated. The obtained results show differences in the thermally induced stresses for sensitive and insensitive materials. But the differences in displacements are not appreciable. Dissert. Abstr.

N86-19651 Texas Univ., Arlington.
COMPUTER ANALYSIS OF THREE-DIMENSIONAL FRAMED STRUCTURES USING AN EQUIVALENT PLANE FRAME METHOD Ph.D. Thesis
Ronald Douglas Matthys 1984 276 p
Avail: Univ. Microfilms Order No. DA8521176

A general computer program for the analysis of three-dimensional structures using an equivalent plane frame method is presented. This program is capable of analyzing both reinforced concrete and structural steel structures. The ability to determine the second order effect of lateral deflections on frame moments, shears, and axial forces is included. Analysis of concrete frames may include the effect of transverse torsional members, loss of stiffness due to cracking, and effective width of slab systems for both the gravity and lateral load cases. A model steel frame was analyzed to verify the technique developed for determining second order effects. A model concrete frame was analyzed to verify the procedures for modifying column or slab stiffnesses for the effects of torsional stiffnesses. The subroutine which calculates the stiffness coefficients for nonprismatic members and the subroutine which calculates the fixed end moments for nonprismatic members were tested independently of the main program.
Dissert. Abstr.

N86-19652 Illinois Univ., Urbana-Champaign.
STRESS INTERFERENCE IN AXISYMMETRIC TORSION OF A TRANSVERSELY ISOTROPIC BODY Ph.D. Thesis
Stephen Michael Heinrich 1985 101 p
Avail: Univ. Microfilms Order No. DA8521786

An unbounded transversely isotropic body of revolution containing two spheroidal cavities is subjected to torsion about its axis of elastic symmetry, which coincides with its axis of revolution. At large distances from the cavities the elastic field approaches the Saint-Venant solution for the torsion of a circular cylinder. The elasticity solution is obtained in series form and numerical results presented for the case of two spherical cavities. Of primary interest is the degree of stress interference between the two perturbations, as a function of the spacing of the cavities and the values of the elastic constants. Dissert. Abstr.

N86-19653 Purdue Univ., West Lafayette, Ind.
SINGULARITY ELEMENTS FOR THE P-VERSION OF THE FINITE ELEMENT METHOD Ph.D. Thesis
Juh-Shiun Shieh 1985 143 p
Avail: Univ. Microfilms Order No. DA8520072

The purpose of this dissertation is to develop an appropriate element model with a general but simple formulation in FEM for improvement of the accuracy and the rate of convergence in computing the strain energy (or stress intensity) for linear elastic mechanics problems. Firstly, the FEM with the highly conforming formulations between elements for the p-version is studied. It is demonstrated that this strategy is only a valid and effective method for one-dimensional problems. Then the square root triangular singularity elements with C sup 0 formulations for the p-version are investigated. A general but simple rule for placing all the boundary and interiour nodal locations for these singularity elements is developed. Based on the numerical analysis of the experimental results obtained from simple practical problems, these singularity elements are not only used for the inverse square root stress singularity problems, but are also applicable to the other linear elastic problems, such as absence of singularity, nearly incompressible materials and variation of strength of singularity problems. Dissert. Abstr.

N86-19654# National Aerospace Lab., Tokyo (Japan).
TORSIONAL STRENGTH OF PRESSURELESS-SINTERED SILICON NITRIDE
Yoshiaki Fujisawa, Katsutoshi Matsusue, and Kitao Takahara 1985 9 p refs In JAPANESE; ENGLISH summary
(NAL-TR-877; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Torsional strength tests of pressureless-sintered silicon nitride were carried out at temperatures ranging from room temperature to 1400 C in air. The torsional strength rapidly decreased at temperatures above 800 C; at 1400 C it was 15% of that at room temperature where a value of 349 MPa was found. The fracture mode and of the crack propagation on the fracture surfaces are discussed. E.A.K.

N86-19655# National Aerospace Lab., Tokyo (Japan). First Airframe Div.
ON THE CONVERGENCE OF THE FINITE ELEMENT SOLUTION OF A NONLINEAR CRACK TYPE PROBLEM IN FINITE ELASTICITY
Kunihiko Ohtake Aug. 1985 14 p refs
(NAL-TR-872T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The crack type problem in a hyperelastic body is investigated. The material is assumed to be isotropic, incompressible, and to have a special nonlinear constitutive equation under large deformation. This body is subjected to shear deformation under the action of body force. The problem leads to the nonlinear boundary value problem. The analytical solution of this problem exhibits the singularity at the crack tip. The convergence rate of the Galerkin approximation solution is studied by introducing the weighted Sobolev space in functional analysis technique. Author

N86-19656# National Aeronautical Lab., Bangalore (India). Materials Science Div.
FATIGUE CRACK PROPAGATION UNDER SPECTRUM LOADING
R. Sunder Mar. 1985 21 p refs
(NAL-TM-MT-8502) Avail: NTIS HC A02/MF A01

This project involved development of a method to predict the fatigue crack propagation process in thin-walled aircraft structural components under flight-by-flight loading. Extensive experimental test results provided the input for software development. They yielded evidence pointing to the complex nature of crack growth under spectrum loading and also provided the basis for procedures adopted for life prediction. A simple engineering method is proposed for estimating fatigue crack propagation life under random loading. Predictions are based on test data obtained under constant amplitude loading. Prediction accuracy favourably compares with that of available techniques. Computation time is extremely small, enabling the use of desktop computer for life predictions. Author

N86-19657# National Aeronautical Lab., Tokyo (Japan).
FUNDAMENTAL INVESTIGATION ON THE IMPACT STRENGTH OF HOLLOW FAN BLADES
Tameharu Ikeda, Toshio Miyachi, and Yasushi Sofue Sep. 1985

23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-879; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Models of hollow fan blades were made and tested to prove that their strength is sufficient for use in real engines. The hollow blades were fabricated by diffusion bonding of two titanium alloy (6Al-4V-Ti) plates, one of which had three spanwise stiffeners and the other being flat plate. The model was a non-twisted tapered blade. Impact tests were carried out on the hollow fan blade models in which the ingestion of a 1.5 pound bird was simulated. Solid blades with the same external form were also tested by similar methods for comparison. The results of these tests show that properly designed hollow blades have sufficient stiffness and strength for use as fan blades in the turbo-fan engine. Author

N86-19658# National Aeronautical Lab., Bangalore (India). Structural Sciences Div.

A FIELD-CONSISTENT TWO-NODED AXISYMMETRIC SHELL ELEMENT

C. RameshBabu and G. Prathap Jan. 1985 38 p refs
(NAL-TM-ST-8501) Avail: NTIS HC A03/MF A01

The efficiency of a field-consistent two-noded linear curved axisymmetric shear-flexible shell element is shown to be due to the removal of both shear and membrane locking. Typical applications illustrate how the field-consistent representation dramatically improves performance, and allows greater flexibility in tailoring element design to satisfy specific problem needs. Author

N86-19659# National Aeronautical Lab., Bangalore (India). Structural Sciences Div.

A LINEAR THICK CURVED BEAM ELEMENT

C. RameshBabu and G. Prathap Apr. 1985 34 p refs
(NAL-TM-ST-8504) Avail: NTIS HC A03/MF A01

Early attempts to derive curved beam and shell elements in a curvilinear system were dramatically unsuccessful. This was wrongly attributed to the failure of these elements to recover strain-free rigid body displacement modes in a curvilinear coordinate description. Recent evidence points to a membrane locking phenomenon that arises when constrained strain-fields corresponding to inextensional bending are not consistently recovered. A simple linear two-noded C sup 0 continuous thick curved beam element based on a curvilinear deep shell theory is derived free from shear and membrane locking. Lack of consistency in the shear and membrane strain-field interpolations in their constrained physical limits (Kirchhoff and inextensional bending limits respectively) causes very poor convergence due to locking and severe spurious oscillations in stress predictions. Error estimates for these are made and verified. Author

N86-19660# National Aeronautical Lab., Bangalore (India). Structural Sciences Div.

A FIELD-CONSISTENT 4-NODED LAMINATED ANISOTROPIC PLATE/SHELL ELEMENT

B. B. Somashekar, G. Prathap, and C. RameshBabu Nov. 1985 37 p refs
(NAL-TM-ST-8515) Avail: NTIS HC A03/MF A01

The development of efficient and accurate finite element models of laminated anisotropic plate and shell behavior has been singularly difficult because of two problems relating to the use of shear deformable theory to describe the elasticity and a description in curvilinear geometry for the shell action. A fuller understanding of these problems has been possible recently, in terms of the field-consistency approach. The problems mentioned earlier in this context are examined and an accurate and reliable element with four nodes and five degrees of freedom at each node is developed, the inplane displacements u and v the transverse displacement w; and section rotations theta sub kappa and theta sub gamma. It is found that the element offered is very reliable and efficient and should be the simplest displacement type element of its class. its convergence properties are insensitive to thickness ratio, degree of anisotropy and extent of inextensional bending action in a shell configuration. E.A.K.

N86-19661*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

APPLICATION OF MATHEMATICAL OPTIMIZATION PROCEDURES TO A STRUCTURAL MODEL OF A LARGE FINITE-ELEMENT WING

Joanne L. Walsh Jan. 1986 43 p refs
(NASA-TM-87597; L-15930; NAS 1.15:87597) Avail: NTIS HC A03/MF A01 CSCL 20K

An optimization system is described that consists of the finite-element analysis program known as Engineering Analysis Language (EAL), the CONMIN optimization program, and a piecewise linear analysis. The optimization analysis system (OPTEAL) is used to minimize the mass of a transport wing subject to stress constraints for two static load conditions. The optimization procedure and the optimization analysis system (OPTEAL) are described and the optiomized results with fully stressed design results compared. Author

N86-19662*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.

FATIGUE BEHAVIOR OF FLEXHOSES AND BELLOWS DUE TO FLOW-INDUCED VIBRATIONS Final Report, 11 Jan. 1985 - 10 Jan. 1986

Prateen V. Desai and Lindsey Thornhill Jan. 1986 84 p refs
(Contract NAS10-17)
(NASA-CR-176481; NAS 1.26:176481) Avail: NTIS HC A05/MF A01 CSCL 20K

The analysis and results developed in a fresh approach to calculate flow induced vibration response of a flexible flow passage are summarized. The vibration results are further examined in the frequency domain to obtain dominant frequency information. A cumulative damage analysis due to cyclic strains is performed to obtain the number of cycles to failure for a metallic bellows of particular specifications under a variety of operational conditions. Sample plots of time and frequency domain responses are included. The complex listing of a computer program is provided. The program successively executes each of the analyses needed to calculate the vibration response, the frequency response, the cyclic strains and the number of cycles to failure. The program prompts the user for necessary input information. Sample data from the program is provided. The fatigue life results obtained by the computer model lie within an acceptable range of previously measured available data. Author

N86-19663*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTATIONAL ENGINE STRUCTURAL ANALYSIS

Christos C. Chamis and Robert H. Johns 1986 20 p refs Proposed for presentation at the 31st International Gas Turbine Conference and Exhibit, Dusseldorf, West Germany, 8-12 Jun. 1986; sponsored by American Society of Mechanical Engineers
(NASA-TM-87231; E-2898; NAS 1.15:87231) Avail: NTIS HC A02/MF A01 CSCL 20K

A significant research activity at the NASA Lewis Research Center is the computational simulation of complex multidisciplinary engine structural problems. This simulation is performed using computational engine structural analysis (CESA) which consists of integrated multidisciplinary computer codes in conjunction with computer post-processing for problem-specific application. A variety of the computational simulations of specific cases are described in some detail in this paper. These case studies include: (1) aeroelastic behavior of bladed rotors, (2) high velocity impact of fan blades, (3) blade-loss transient response, (4) rotor/stator/squeeze-film/bearing interaction, (5) blade-fragment/rotor-burst containment, and (6) structural behavior of advanced swept turboprops. These representative case studies are selected to demonstrate the breath of the problems analyzed and the role of the computer including post-processing and graphical display of voluminous output data. Author

N86-19664# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

ASYMPTOTIC FIELDS IN STEADY CRACK GROWTH WITH

LINEAR STRAIN-HARDENING
P. P. Castaneda Aug. 1985 62 p
(Contract N00014-84-K-0510)
(AD-A160921; MECH-69) Avail: NTIS HC A04/MF A01 CSCL 20/11

The asymptotic stress and velocity fields of a crack propagating steadily and quasi-statically into an elastic-plastic material are presented. The material is characterised by J sub 2 flow theory with linear strain-hardening. The possibility of reloading on the crack flanks is taken into account. The cases of anti-plane (mode III), plane strain (modes I and II), and plane stress (modes I and II) are considered. Numerical results are given for the strength of the singularity and for the distribution of the stress and velocity fields in the plastic loading, elastic unloading and plastic reloading regions, as functions of the strain-hardening parameter. An attempt is made to make a connection with the perfectly-plastic solutions in the limit of vanishing strain-hardening. Author (GRA)

N86-19665# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
ASYMPTOTIC FIELDS OF A PERFECTLY-PLASTIC, PLANE-STRESS MODE 2 GROWING CRACK
P. P. Castaneda Aug. 1985 11 p
(Contract N00014-84-K-0510)
(AD-A161006; DAS-MECH-70) Avail: NTIS HC A02/MF A01 CSCL 20/11

The asymptotic near-tip stress and velocity fields are presented for a plane-stress mode II crack propagating quasi-statically in an elastic-perfectly plastic Mises solid. The solution is found to have fully continuous stress and velocity fields, and a configuration similar to that of the anti-plane strain problem: a singular centered fan plastic sector ahead of the crack, followed by an elostic unloading sector and a constant stress plastic sector extending to the crack flank. The impossibility of a plane-stress mode I crack solution having these properties is also discussed. Author (GRA)

N86-19666# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
EFFECTS OF SHEAR STIRRUP DETAILS ON ULTIMATE CAPACITY AND TENSILE MEMBRANE BEHAVIOR OF REINFORCED CONCRETE SLABS Final Report
Stanley C. Woodson Aug. 1985 184 p
(AD-A161222; WES/MLP/SL-85-4) Avail: NTIS HC A09/MF A01 CSCL 20/11

At the time this study was initiated, civil defense planning in the United States called for the evacuation of nonessential personnel to safe host areas when a nuclear attack is probable, requiring the construction of blasts shelters to protect the keyworkers remaining in the risk areas. The placement of shear stirrups in the one-way reinforced concrete roof slabs of the shelters will contribute significantly to project costs. Ten one-way reinforced concrete slabs were statically and uniformly loaded with water pressure, primarily to investigate the effect of stirrups and stirrup details on the load-response behavior of the slabs. The slabs had clear spans of 24.0 inches, span to effective depth ratios of .4, tensile reinforcement of 0.75 percent, and concrete strengths of approximately 5,000 psi. The test series significantly increased the data base for uniformly loaded one-way slabs. Support rotations between 13.1 and 20.6 degrees were observed. A more ductile behavior was observed in slabs with construction details, implying better concrete confinement due to more confining steel (i.e., closely spaced stirrups, double-leg stirrups, and closely spaced principal reinforcing bars). The parameters investigated did not appear to have a significant effect on ultimate load capacity. GRA

N86-19667# Sandia National Labs., Albuquerque, N. Mex.
NUMERICAL AND EXPERIMENTAL STUDY OF THE INDENTATION HARDNESS TEST
R. J. Bourcier, C. M. Stone, and F. G. Yost Sep. 1985 30 p
(Contract DE-AC04-76DP-00789)
(DE86-002095; SAND-85-0486) Avail: NTIS HC A03/MF A01

The process of indentation hardness testing has been analyzed both experimentally and numerically. A set of indentation experiments has been performed for several materials with conical/pyramidal and spherical indenters. The large strain elastoplastic finite element program JAC has been used, with tensile stress-strain data as input, to model these tests as well as tests reported in the literature. Load-depth curves generated with our finite element model deviate less than 15% from experimental data (both our own as well as literature values) for both large scale (up to 250 (MU)m depth) and small scale (less than 5 (MU)m depth) indentation tests for all indenter geometries examined. Also, agreement between the model and micro-micro (less than 1 (MU)m) pyramid indentation data from the literature is quite good. These results suggest that load-depth response of indentation hardness tests can be successfully predicted with a continuum based finite element model. In addition, examination of the finite element results has suggested several corrections based on geometry which must be included when computing the hardness of near surface material. DOE

N86-19668# Lawrence Livermore National Lab., Calif.
ABRASION AND IMPACT RESISTANT COATINGS Quarterly Report
T. Hirschfeld Aug. 1985 24 p
(Contract W-7405-eng-48)
(DE86-000739; UCID-20516-1) Avail: NTIS HC A02/MF A01

We have proven that a layer of reinforcing filaments emerging out of the surface of a composite provides it with substantial protection from abrasion and impact. We have determined the geometrical constraints on fiber diameter, length, root depths, orientation, and packing density required for this protection. Substantial performance has been demonstrated for even incompletely optimized systems. We are in the process of extending this technology to first aluminum and then steel structural metal protection. Pretreatment and assembly methods for such materials have been developed. DOE

N86-19669# Brookhaven National Lab., Upton, N. Y.
CHARACTERISTIC LENGTH SCALES IN GASEOUS HYDROGEN EMBRITTLEMENT
K. Sieradzki, J. K. McCoy, A. J. Markworth, and J. H. Holbrook 1985 13 p Presented at the American Society of Mechanical Engineers Winter Annual Meeting, Miami, Fla., 17 Nov. 1985 Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract DE-AC02-76CH-00016)
(DE86-000629; BNL-37027; CONF-851125-13) Avail: NTIS HC A02/MF A01

This paper presents an analysis which allows for an experimental determination of an upper bound to the characteristic length scale in a gaseous hydrogen embrittlement system. Our approach is based upon an ac analysis of the coupled adsorption diffusion equations for the hydrogen metal system. We show how the frequency of the driving pressure affects the depth below the surface at which surface and bulk processes effectively decouple from one another. This decoupling distance serves as a useful probe for the location of the so-called hydrogen embrittlement process zone. DOE

N86-19670# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
STRESS INTENSITY FACTORS OF HOLE EDGE CRACKS. COMPARISON BETWEEN ONE CRACK AND TWO SYMMETRIC CRACKS
J. Schijve Mar. 1983 7 p refs
(VTH-M-458) Avail: NTIS HC A02/MF A01

Numerical results for the stress intensity factor (K-factor) of a crack at the edge of a hole in an infinite sheet published by Bowie (1956), Newman (1971), and Tweed and Rooke (1973) are compared. Bowie solved the problem for a single crack and two symmetric cracks. Newman treated the results for two symmetric cracks, and Tweed and Rooke for a single crack. The K-factors calculated by Newman for a single crack at the edge of a hole, and by Tweed and Rooke for two symmetric cracks are considered to be significantly more accurate than the Bowie data. Equations

which closely represent the former data are presented.
Author (ESA)

N86-19671# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE INFLUENCE OF PRESTRAIN LEVEL ON THE CRACK PROPAGATION OF ARALL UNDER A MODE 1 CONDITION
M. L. C. E. Verbruggen Jul. 1983 30 p refs Sponsored by ENKA
(VTH-M-480) Avail: NTIS HC A03/MF A01

The influence of prestrain level of ARALL sheets on crack growth under a mode 1 loading condition was assessed using the wedge-edge test to study initial crack growth after insertion of the wedge, and crack growth due to environmental exposure. Results show that the higher the prestrain level, the larger the initial crack length. Crack growth due to environmental exposure is large in the first 24 hr for all prestrain levels and environmental temperatures. A temperature difference of 40C does not affect crack growth behavior. Crack growth drops rapidly after 24 hr for all prestrain levels and environmental temperatures. Crack stop is attained after a rather long exposure period. The linear relation between crack length and prestrain level is mostly destroyed because of stress intensity decreases at the crack tip of specimens with higher prestrain levels. Author (ESA)

N86-19672# Netherlands Energy Research Foundation, Petten.
A STATE OF THE ART REPORT ON FATIGUE LIFE EVALUATION OF NOTCHED COMPONENTS AND WELDED JOINTS
M. Skorupa and J. Prij Jun. 1985 108 p refs
(ECN-166; B8566490) Avail: NTIS HC A06/MF A01

The evaluation of the stress intensity factor (KI) of a semielliptical surface crack initiated at a notch is discussed. The state-of-the-art of fatigue life estimates of notched components, and information on semielliptical surface cracks are reviewed. Crack shape development, KI solutions, and fatigue life prediction for smooth specimens using the conventional crack propagation data obtained from through cracks are considered. A KI solution for semielliptical surface cracks in a smooth plate obtained by three-dimensional finite elements analyses for selected crack shapes and depths is presented. Author (ESA)

N86-19673# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
A SHORT COURSE ON FRACTURE AND FRACTURE MECHANICS OF METALLIC MATERIALS
R. J. H. Wanhill Mar. 1984 82 p
(NLR-MP-84045-U; B8572247) Avail: NTIS HC A05/MF A01

The visual presentation sheets of a course on fracture and fracture mechanics in metallic materials are reproduced. The course includes an introduction to fracture mechanics; fracture mechanisms in metallic materials; and the influence of material behavior on fracture mechanics properties. The course reviews the relations between fracture mechanics properties (especially those measured under nominally linear elastic conditions), fracture mechanisms, and microstructures of structural metallic materials. Author (ESA)

N86-19674# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
SIZE EFFECTS ON THE FATIGUE STRENGTH OF A WELDED SPECIMEN (A BRIEF NOTE)
J. Schijve Mar. 1984 10 p refs
(VTH-M-504) Avail: NTIS HC A02/MF A01

The relation between welded steel plate thickness and fatigue life and fatigue strength is discussed. Qualitative considerations on the stress concentration factor and the stress intensity factor of the welded specimens suggest that a higher plate thickness can lead to a lower fatigue resistance. There is a need for a quantitative investigation of these factors in order to understand the geometrical effects involved. Author (ESA)

N86-19675# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE CRACK GROWTH RATE OF A CRACK IN A WIDTH TAPERED DOUBLE CANTILEVERED BEAM (WTDCB). SPECIMEN IN BOTH A CONSTANT AND LINEARLY VARYING EXTERNAL LOAD CONDITION
M. L. C. E. Verbruggen Jun. 1984 12 p
(VTH-M-513) Avail: NTIS HC A02/MF A01

Use of the width-tapered-double-cantilever-beam (WTDCB) test to obtain energy release rate data of adhesives and composites is considered. Equations for the crack growth rate for a constant and linearly varying applied load are derived. The theoretical results are compared with experimental data. Results show that growth rate of a crack in a WTDCB specimen can be well predicted in a constant and linearly varying load condition. In the latter case, a constant load approach does not result in accurate data.
Author (ESA)

N86-19676# Centre National d'Etudes Spatiales, Toulouse (France). Centre Spatial.
STRUCTURAL RESPONSE TO LOW FREQUENCY ENVIRONMENTS [REPONSE DES STRUCTURES A UN ENVIRONNEMENT BASSE FREQUENCE]
Alain Girard Jun. 1985 56 p refs In FRENCH; ENGLISH summary
(CNES-NT-116) Avail: NTIS HC A04/MF A01

The computation of the response of a structure to a low frequency sine, transient, or random environment is discussed. The structure is characterized by the eigenmodes which are assimilated to single degree of freedom systems. The structural response is computed by superposition of the model responses of single degree of freedom systems. The analysis of the sine response introduces the concept of transfer functions between excitation and responses. The same transfer functions are used to compute random and transient response. The shock spectrum associated with the mode to single degree-of-freedom system equivalence gives quick information about structural response.
Author (ESA)

N86-19385# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
TEST FACILITIES
R. Prinz and K. Schmidt *In its* Mechanical Properties and Damage Mechanisms of Carbon Fiber-Reinforced Composites. Tension Loading Jun. 1985 p 17-32 (For primary document see N86-19384 10-24)
Avail: NTIS HC A18/MF A01; DFVLR, Cologne DM 125

42 GEOSCIENCES (GENERAL)

N86-19677# European Space Agency, Paris (France).
THE USE OF SATELLITE DATA IN CLIMATE MODELS
J. J. Hunt, comp. Sep. 1985 215 p refs Conference held in Alpbach, Austria, 10-12 Jun. 1985; sponsored by Austrian Solar and Space Agency, ESA, Bundesministerium fuer Forschung und Technologie, Commission of European Communities, European Science Foundation and World Climate Research Program
(ESA-SP-244; ISSN-0379-6566) Avail: NTIS HC A10/MF A01

The use of satellites for remote sensing of ocean waves, ocean circulation, sea level, sea ice, ice and snow and sea surface temperature, was discussed. The ESA ERS-1 program and its national data centers were described. For individual titles, see N86-19678 through N86-19707.

N86-19678# Massachusetts Inst. of Tech., Cambridge.
IMPACT OF SATELLITE MEASUREMENTS ON OCEANOGRAPHIC COMPONENT OF THE WCRP
C. Wunsch *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 3-6 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The use of satellite scatterometry, altimetry, gravity, and IR/microwave thermometry data in oceanography is discussed.

The satellite needs of the Tropical Ocean-Global Atmosphere program and the World Ocean Circulation Experiment are reviewed. Accuracy, precision, sampling, and coverage requirements on satellite systems are considered. Author (ESA)

N86-19679# European Centre for Medium-Range Weather Forecasts, Reading (England).
FOUR-DIMENSIONAL DATA ASSIMILATION INTO ATMOSPHERIC GLOBAL MODELS c47
L. Bengtsson *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 7-17 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The status of four-dimensional atmospheric data assimilation is reviewed. Numerical models make efficient use of asynoptic observations of wind, temperature, and moisture from satellites. In data assimilation systems, observations are assimilated continously in time or are grouped in time-intervals of 3 to 6 hr where they are checked and analyzed before insertion into the model. The accuracy of the initial state depends on the data-assimilation technique as well as the correct interpolation of data in space and the merging between observations and model information. The accuracy of the ECMWF operational model, as expressed by 6 hr forecasts, is comparable to radiosonde observations of wind and temperature over Europe and North America. Research is concerned with improving the assimilation of single level data and a better usage of satellite observations, in particular in the Tropics. Author (ESA)

N86-19680# Royal Netherlands Meteorological Inst., De Bilt.
INTRODUCTION TO WAVE MODELS AND ASSIMILATION OF SATELLITE DATA IN WAVE MODELS c48
G. J. Komen *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 21-25 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Knowledge of the development of wind driven ocean waves, and wave models are discussed. The models integrate the energy transfer equations for the two dimensional wave spectrum numerically in time. The solution depends on external wind fields, specified in advance. Main applications are for ship routing, off-shore activities, and coastal defense. Validation of real-time model forecast results indicates the need for improvement of model results and wind input. Very little experience exists with the assimilation of wave observations into initial fields. A hindcast indicates that the effects of inaccuracies in the specified wind fields can be compensated by assimilation of observed wave parameters. Author (ESA)

N86-19681# Meteorological Office, Bracknell (England).
ALGORITHMS FOR WIND SCATTEROMETER PROCESSING c48
D. Offiler *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 27-31 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The measurement of surface wind speed and direction over the ocean, using scatterometry is introduced. The theoretical and experimental background to the technique and how this translates into practical instruments is outlined. The algorithms used to retrieve the wind vectors are described. Algorithms for the ERS-1 mission are broadly similar to those previously used for the SEASAT SASS instrument. Author (ESA)

N86-19682# Bundeswehr Munich Univ., Neubiberg (West Germany).
ALGORITHM FOR WIND SCATTEROMETER DATA ANALYSIS-AMBIGUITY SUPPRESSION c48
K. J. Schwenzfeger *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 35-36 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

An algorithm for retrieving the wind vectors of the bias corrected backscatter coefficients derived from simulated ERS-1 wind scatterometer measurements is described. The main task is wind vector estimation by fitting the beam ordered sigma zeros onto the ESA C-band model using a Bayesian type estimator (BE). Extremizing BE gives up to four wind vectors for each cell of the swath. The goodness of fit gives a ranking of solutions. The results of case studies show that nearly 100% of the rank 1 solutions are the correct wind vectors, so no additional postprocessing is necessary. Author (ESA)

N86-19683# Bremen Univ., (West Germany). Fachbereich 1.
MICROWAVE MEASUREMENTS OF THE SEA SURFACE c48
W. Alpers *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 41-45 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Interpretation of ERS-1 Active Microwave Instrument (AMI) data in terms of oceanographic parameters is discussed. In order to extract quantitative information from the SAR image, the C-band modulation transfer function (MTF) was calculated, using data from a modulation experiment in the North Sea. Imaging of large scale oceanic features is considered. Author (ESA)

N86-19684# Max-Planck-Inst. fuer Meteorologie, Hamburg (West Germany).
ASSIMILATION OF MICROWAVE DATA IN ATMOSPHERIC AND WAVE MODELS c48
K. Hasselmann *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 47-52 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Use of ERS-1, N-ROSS, TOPEX, and MOS-2 satellite data on global sea surface topography, surface winds, ocean waves, and sea ice for climate research and weather and wave forecasting is discussed. The need for an end-to-end data processing and assimilation system, including algorithms, dynamic data assimilation methods, and high resolution models, in order to produce the basic global data sets required for climate research is considered. It is shown that the data processing needs for climate studies are essentially the same as the processing needs for forecasting applications, so that the same system can satisfy both purposes. The relation of this end-to-end system, designed for the quasi-real time generation of level 3 gridded wind and wave fields, with other components of the ground segment, such as the generation of fast delivery products or the primary archiving facilities, is treated. Author (ESA)

N86-19685# Kiel Univ. (West Germany).
INTRODUCTION TO OCEAN CIRCULATION MODELS c48
J. Willebrand *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 63-64 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Prognostic and diagnostic ocean models are reviewed, and their equations of motion, including primitive equation and geostrophic models are discussed. Circulation models can reproduce the wind-driven subtropical gyres, and the equatorial circulation system including its variations on time scales up to a few years. The effect of quasi-geostrophic eddies is fairly well simulated. On longer time scales, the situation is less satisfactory with respect to thermohaline processes. It seems likely that this situation will improve by 1990 when several satellites are expected to be in operation. A considerable effort, however, is needed for the development of circulation models that can assimilate wind and altimeter data on a global basis. Author (ESA)

N86-19686# Meteorological Office, Bracknell (England). Dynamical Climatology Branch.
COMMENTS ON DATA REQUIREMENTS FOR OCEAN CLIMATE STUDIES c48
H. Cattle *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 67-69 refs (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

The requirements for carrying out noninteractive integrations of ocean (and sea ice) models are discussed. Such integrations require forcing data to be specified from a knowledge of atmospheric parameters and the sea surface temperature and ice characteristics. In such integrations, the momentum flux is often specified directly via the vector surface stress fields (expressed in the main as monthly means. To determine the heat exchange across the interface, it is appropriate to specify the incoming radiative fluxes together with the air temperature, humidity, wind speed, and surface pressure from which the outgoing radiative fluxes and turbulent, sensible, and latent heat exchanges can be derived using the model predicted sea surface temperature and sea ice characteristics. The use of scatterometers and satellites, particularly for data-sparse areas of the Southern Hemisphere is discussed. Author (ESA)

N86-19687# Paris VI Univ. (France). Lab. de Physique et Chimie de l'Hydrosphere.

ANALYSIS AND INTERPRETATION OF ALTIMETRY DATA c48

J.-F. Minster *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 71-72 refs (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

Ways to extract the variability signal on the mesoscale and large scale from satellite altimetry studies of ocean dynamics are reviewed. Methods include comparison of the variability of signals along a repetitive track with the dynamic topography of the area; analysis of the residuals of the altimetric measurement at crossovers of ascending and descending tracks, after adjustment of the latter to minimize orbit errors; and use of the distance of individual track measurements to a reference mean sea surface. By using a large set of short crossover-adjusted arcs, it is possible to map larger than mesoscale variability. Author (ESA)

N86-19688# Imperial Coll. of Science and Technology, London (England). Atmospheric Physics Group.

ALTIMETRIC OBSERVING SYSTEM SIMULATION STUDIES WITH AN EDDY RESOLVING OCEAN CIRCULATION MODEL c48

J. Marshall *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 73-76 refs (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

Synoptic mapping of geostrophic eddies from altimetry by assimilation into a quasi-geostrophic ocean model is discussed. It is shown that for synoptic mapping the accuracy of the analysis is limited by the finite temporal and spatial resolution possible with one satellite, rather than the random error in the instrument. There is a clear advantage in flying several moderately accurate altimeters rather than one very precise instrument. The importance of ensuring that altimetric missions are synchronized so that more than one altimeter is flying simultaneously is stressed.

Author (ESA)

N86-19689# Utrecht State Univ. (Netherlands). Inst. of Meteorology and Oceanography.

SEA LEVEL AND CLIMATE VARIATIONS c48

J. Oerlemans *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 81-85 refs (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

Factors governing sea level and the relation between sea level and carbon dioxide are reviewed. The use of satellite data to study global variations in sea level is discussed. The greenhouse effect on the polar ice sheets, and consequences for sea level, are assessed. It is concluded that data are insufficient to make predictions other than that global temperature will increase.

Author (ESA)

N86-19690# Max-Planck-Inst. fuer Meteorologie, Hamburg (West Germany).

SEA ICE MODELS AND REMOTE SENSING c48

W. D. Hibler *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 87-94 refs Sponsored by Office of Naval Research and Max-Planck Institute fuer Meteorologie, Hamburg (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

Sea ice modeling and how satellite remote sensing can be used in model verification, improvement, and applications are discussed. Ice dynamics, including the relevance of ice drift and deformation to climate are considered. The role and justification for the use of nonlinear plastic rheologies is described. In order to show the necessity for ice-ice interaction in coupled dynamic-thermodynamic simulations, seasonal Arctic simulation results using only free drift are compared to those using a plastic rheology. Results without ice interaction yield a totally unacceptable ice build-up, even after only a 1 yr integration. Ice edge variation and coupled ice ocean models are mentioned. Author (ESA)

N86-19691# Institute of Oceanographic Sciences, Birkenhead (England).

ACCURACY OF EXISTING OCEAN TIDE MODELS c48

P. L. Woodworth *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 95-98 refs (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

The Schwiderski (1983) and Parke-Hendershott (1980) ocean tide models are assessed. The Schwiderski model is claimed to be capable of computing the instantaneous M2 partial ocean tide with an accuracy of 5cm or better at any time and anywhere in the open ocean although with certain reservations for coastal and border seas. Pelagic data show this claim to be optimistic. Similar model claims are made for the other tidal constituents resulting in a predicted combined tide accuracy of 10cm. Until copious altimeter data become available there is no real way, other than by additional tide gage measurements, of checking them. The Parke-Hendershott model is of comparable accuracy and is subject to similar difficulties of validation on a global basis. Author (ESA)

N86-19692# Technical Univ. of Denmark, Lyngby.

APPLICATION OF SAR AND OTHER REMOTE SENSING DATA IN STUDIES OF THE ATMOSPHERE-OCEAN-ICE INTERACTION c48

P. Gudmandsen *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 107-111 refs (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

The physics of the atmosphere-ocean-ice interaction, the processes of the formation of sea ice and its characteristics from a remote sensing point of view, and the relevant remote sensing methods are reviewed. Use of the ERS-1 Active Microwave Instrument in the Arctic and Antarctic is discussed. The need for preparatory observation and modeling research to fully exploit satellite capabilities is stressed. Author (ESA)

N86-19693# National Museum of Natural History, Paris (France). Lab. d'Oceanographic Physique.

SCIENTIFIC APPLICATION OF SAR DATA TO SEA ICE STUDIES. SEA ICE MODELS c48

J. C. Gascard *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 113-114 (For primary document see N86-19677 10-42)

Avail: NTIS HC A10/MF A01

Sea ice observations from space are discussed and SAR contributions to sea ice numerical modeling are assessed. Satellite observations of sea ice concentrations in two dimensions help considerably in tuning models for a better prediction of ice thickness and for sea ice mass balance estimations. Author (ESA)

N86-19694# Atmospheric Environment Service, Ottawa (Ontario).

SCIENTIFIC APPLICATION OF PASSIVE MICROWAVE SATELLITE DATA FOR ICE MONITORING AND RESEARCH c48

I. G. Rubinstein (Ph.D. Associates, North York, Ontario) and R. O. Ramseier *In* ESA The Use of Satellite Data in Climate Models

Sep. 1985 p 117-123 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Algorithms for determination of total sea ice concentrations and ice type identification were tested during near real-time operational production of sea ice charts for the Arctic, Canadian East Coast, and the East Greenland Sea regions. Using computer contouring techniques, the sea ice parameters were determined with a spatial location accuracy within one half of a 37 GHz footprint (15 km). Model calculated total ice concentrations are in close agreement with values measured by the airborne sensors (< 10% deviation). In areas where gray and very young ice are present, the total ice concentrations are underestimated by 50%. The near real-time operational testing of the algorithm derived ice and wind charts provides very valuable information for improvement of the existing sea ice algorithms. The all weather capabilities of the spaceborne passive microwave sensors are positively established. Author (ESA)

N86-19695# Science Research Council, Chilton (England). Rutherford Appleton Lab.
FUTURE PASSIVE MICROWAVE SATELLITE DATA FOR SEA-ICE RESEARCH **c48**
D. L. Croom *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 125-127 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The potential of the passive microwave radiometers which form part of the Along Track Scanning Radiometer (ATSR) to be flown on ERS-1, and the Advanced Microwave Sounding Unit (AMSU) to be flown on the NOAA-TIROS series, for studies of sea-ice is surveyed. The ATSR will carry limited, but useful passive microwave channels for sea-ice studies, especially for assessing the value of altimetry over sea-ice. The AMSU-B will be a source of extensive sea-ice data and will provide it over a long (20yr plus) time scale. The AMSU-B should also be considered as a potential valuable source of data for land snow-cover. Author (ESA)

N86-19696# Helsinki Univ. of Technology, Espoo (Finland).
MAPPING OF SNOW BY PASSIVE AND ACTIVE MICROWAVE SENSORS **c43**
M. Hallikainen and R. Kuittinen (Technical Research Centre of Finland, Espoo) *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 131-132 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

A snow-related research program for ERS-1 is proposed. Discrimination of wet snow (melting season) from bare soil is possible using the SAR and the wind scatterometer. Special attention should be paid to observing the effects from various land-cover categories to the discrimination accuracy. With the SAR, the 25m resolution makes it possible to distinguish in a detailed manner backscattering contributions from land-cover categories. With the wind scatterometer, the situation is comparable to corresponding Nimbus-7 SMMR studies (resolution tens of kilometers). The data should be complemented with airborne gamma spectrometer measurements, NOAA data, Nimbus-7 SMMR (or DMSP/N-ROSS SSM/I) data, and in situ measurements. Finland is an excellent test site for snow studies. Author (ESA)

N86-19697# Innsbruck Univ. (Austria). Inst. of Meteorology and Geophysics.
MONITORING OF SNOW AND LAND ICE PARAMETERS: POSSIBILITIES AND CONSTRAINTS OF SAR AND MICROWAVE IMAGING SYSTEMS **c43**
H. Rott *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 133-135 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Global monitoring of cryospheric parameters using satellite-borne radar and microwave imaging systems, especially ERS-1, is considered. The different capabilities regarding dry and wet snow cover clearly indicate a combination of SAR and microwave radiometer as optimum snow sensor. However major differences in areal coverage and spatial resolution complicate the synergistic use of these sensors. An SMMR-like sensor provides global coverage in 3 days of operation. The spatial resolution (30 km in the 37 GHz-channel) is adequate for large scale climate studies. An improvement of resolution to a few kilometers appears feasible without major technical problems. The ERS-1 Active Microwave Instrument narrow swath and the restrictions in sensor operation time mean that the system can be used for detailed studied only over a few limited areas. The ERS-1 SAR system has only supplementary functions for land cryosphere monitoring and is of limited value for climatological studies on snow and land ice. A potential operational application is the surveillance of lake and river ice. Author (ESA)

N86-19698# Science Research Council, Chilton (England). Rutherford Appleton Lab.
PRECISE SST DATA FROM SATELLITES **c48**
D. T. Llewellyn-Jones *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 139-142 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The importance of ocean skin tempratures, in contrast to bulk temperatures, in climate models using sea surface temperatures measured by the ERS-1 Along Track Scanning Radiometer (ATSR) is pointed out. The ATSR accuracy is expected to reach 0.3 K, i.e., a factor of 2 better than AVHRR, and modellers who require bulk temperatures should say so, as this affects data products and their treatment. Author (ESA)

N86-19699# Istituto di Fisica dell Atmosfera, Rome (Italy).
REMOTE SENSING OF SEA SURFACE TEMPERATURE **c48**
G. Dalu and A. Viola *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 143-145 refs Sponsored by CNR (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The methodology that lies behind the algorithms used to retrieve the sea surface temperature from infrared radiometric data is examined with a radiative transfer model, that simulates the response of the atmosphere for different temperature and water vapor profiles. Generally linear algorithms are used to evaluate the sea surface temperature from the AVHRR data. Although the results obtained show that a nonlinear algorithm is more accurate, a linear algorithm can give better results if it is optimized for a particular region and season. Results show that the algorithms found in the literature are appropriate to particular data sets, and no single algorithm can be applied to other samples if they are from a completely different area or a different season. Author (ESA)

N86-19700# Mullard Space Science Lab., Dorking (England).
POST LAUNCH CALIBRATION AND VALIDATION OF THE ALONG TRACK SCANNING RADIOMETER (ATSR) **c48**
I. M. Mason *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 149-150 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

On-board calibration and validation of the ERS-1 Along Track Scanning Radiometer (ATSR), used for sea surface temperature (SST) measurement, are discussed. It is important that on-board calibration and validation are carried out to a precision compatible with the lowest expected atmospheric noise (0.1K RMS). The skin SST should ideally be the validated ATSR product, for reasons of accuracy and because of the role of skin SST in the ocean/atmosphere heat exchange. If possible, each algorithm should be validated separately, using a variety of instruments and sites. To retain the ATSR levels of precision, any correction of algorithms using validation data should be done by modeling the physical processes giving rise to the algorithm errors. An improved understanding and modeling of the skin/bulk SST differences will allow the validation of ATSR using bulk SST and aid the incorporation of ATSR data in climate models. Author (ESA)

N86-19701# Oxford Univ. (England). Dept. of Atmospheric Physics.
FOUR-DIMENSIONAL DATA ASSIMILATION IN TOGA MODELS c48
D. L. T. Anderson and A. M. Moore *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 151-153 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Use of ocean surface stress and heat fluxes in Tropical Ocean Global Atmosphere program models is discussed. Since the forcing fields are perfectly known and the ocean is not totally deterministic, redundancy must be built in. Measurements give mass field information, and numerical models indicate that this data may be very useful. The models do not reject height field data. Altimeter data could be very useful for interpolating between tide gage networks. Altimeter data can also be assimilated into models. The best method of projecting this data onto the vertical model structure uses XBT data. Sea surface temperatures (SST) used with XBT data may be very useful. Altimetry and SST can be used for model verification even if they are not used for assimilation. Author (ESA)

N86-19702# Science Research Council, Chilton (England). Rutherford Appleton Lab.
THE USE OF AIRBORNE MICROWAVE INSTRUMENTS TO GATHER DATA FOR THE VALIDATION OF ERS-1 WIND AND WAVE PRODUCTS c48
R. J. Powell *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 155-156 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

It is suggested that the main European effort to validate the wind and wave data products of ERS-1 should be concentrated in the Northeast Atlantic and Norwegian Sea. Conventional oceanographic data gathering techniques using ships and buoys should be augmented with permanently deployed and well-validated master stations and airborne instrumentation. The need to site such stations and altimeter transponders on the ground track argues strongly for the early selection of the location of 3 day repeat ground tracks and for ensuring that any higher repeat cycle used later is a multiple of 3. Author (ESA)

N86-19703# Institute of Oceanographic Sciences, Wormley (England).
WINDS FOR CLIMATE RESEARCH FROM THE ERS-1 AND N-ROSS SCATTEROMETERS c48
T. H. Guymer *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 157-159 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

Requirements for sea-surface wind in climate research are discussed in terms of accuracy and sampling considerations. Very stringent accuracies are needed and it is particularly important that biases in areal and temporal mean winds be minimized. These may arise from geographical biases in algorithms tuned to limited comparison data sets and from atmospheric attenuation effects. A single satellite scatterometer is incapable of providing adequate sampling and it is envisaged that the surface wind fields will be obtained from a combination of ERS-1, N-ROSS and in-situ data, including those of the Voluntary Observing Ships. Author (ESA)

N86-19704# European Space Agency, Paris (France).
REVIEW OF SCIENTIFIC AND TECHNICAL WORK REQUIRED BEFORE THE LAUNCH OF ERS-1: THE VIEW OF ESA c48
G. Duchossois, J. Louet (ESA/ESTEC, Noordwijk, Netherlands), C. R. Francis (ESA/ESTEC, Noordwijk, Netherlands), and E. Attema (ESA/ESTEC, Noordwijk, Netherlands) *In its* The Use of Satellite Data in Climate Models Sep. 1985 p 163-173 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The ESA views and plans for the utilization of ERS-1 data, sensor calibration and data validation, and activities for the coordination/cooperation with entities interested in ERS-1 and/or having similar programs under preparation are summarized. The ERS-1 will study coastal zones and global ocean processes which, together with the monitoring of polar regions, will provide a major contribution to the World Climate Research Program. It will establish, develop, and exploit coastal, ocean, and ice applications of remote sensing data. These applications are related mainly to a better knowledge of ocean and ice parameters and sea-state conditions. The Active Microwave Instrument and radar altimeter are presented. Author (ESA)

N86-19705# Meteorological Office, Bracknell (England).
WIND DIRECTION AMBIGUITY SUPPRESSION ALGORITHMS c48
D. Offiler *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 175-176 refs (For primary document see N86-19677 10-42)
(Contract ESA-6154/85/NL-BI)
Avail: NTIS HC A10/MF A01

The problem of removing the ambiguity in the ERS-1 Active Microwave Instrument scatterometer wind directions is discussed. The scatterometer product was simulated using the C-band model with winds from the UK Meteorological Office forecast model. Objective and subjective means were used to suppress the ambiguity. The objective method was divided into two separate algorithms: one using no external data, the other using an independent wind field. The algorithms are described and results presented. Author (ESA)

N86-19706# Mullard Space Science Lab., Dorking (England).
THE UK ERS DATA CENTRE c14
C. G. Rapley *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 177-179 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The data facility to be built by the UK as part of its ERS-1 program and a measure taken within that facility to alleviate the problem of inadequate access to hardware and data sets are described. The main functions of the center are data receipt and archive; algorithm development; off-line product generation; product validation/quality monitoring; customer services; and dispatch.
Author (ESA)

N86-19707# Centre National d'Etudes Spatiales, Paris (France). Earth Sciences and Applications Div.
THE CERSAT/AVISO/ALGOS: THE FRENCH PROGRAM FOR A COHERENT OCEANOGRAPHIC DATA BASE c14
B. Nutten *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 181-183 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

The French national plan for data handling of ERS-1 and future space oceanographic missions is presented. It is based on two data centers and one group. The CERSAT is the ERS-1 off-line low bit rate data center, part of the four-component preprocessing and archiving facilities managed by the Earthnet Program Office, aimed at production of geophysical data. The AVISO is a multisatellite data center for archiving geophysical oceanographic data, and processing of value-added products. The purpose of the ALGOS group, coordinated by scientists and engineers, is the development of models and algorithms required by the Data Centers.
Author (ESA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N86-19708 New South Wales Univ., Kensington (Australia). School of Surveying.
THE COMBINATION OF VLBI AND GROUND DATA FOR

GEODESY AND GEOPHYSICS Ph.D. Thesis Abstract Only
Bruce R. Harvey Feb. 1985 2 p
Avail: Issuing Activity

An analytical procedure for the combination of VLBI and geodetic survey measurements and their evaluation and comparison was developed. Crustal deformation analysis, comparisons between space techniques, and the strengthening of geodetic networks are the main applications. The VLBI analysis is reviewed and the variance covariance matrix of the obserables is investigated. The effects of systematic errors, particularly biases in the tropospheric corrections, on VLBI results are investigated and classified. The results of the first geodetic VLBI experiment within Australia are presented and their accuracies estimated. A method which combines VLBI and ground data by estimating the transformation parameters relating the preadjusted coordinates of the points of each network is recommended. Methods for studying regional strain are discussed. Several models for 2D and 3D strain are examined. It is recommended that VLBI and ground data be combined at each epoch. Any strain detected is not due to crustal movements. If no significant strain is detected, then the geophysical strain between these epochs can be determined. E.A.K.

N86-19709 New South Wales Univ., Kensington (Australia).
A COMPARISON OF SPACE VECTORS DERIVED FROM SATELLITE DOPPLER OBSERVATIONS Abstract Only
Donald Frederick Wood 1984 2 p
Avail: Issuing Activity

A multi-station Doppler observation program was conducted across the Australian continent between February and June of 1982. Each phase of the program included up to thirteen Doppler Satellite receivers which had been manufactured by the Magnavox Company in U.S.A. The object of this project was to ascertain the accuracy of the Magnavox receivers in determining a position by the technique of semi-short arc translocation when compared to known terrestrial data. The Magnavox results have also been compared to the same satellite data which was processed in the computer programs PREDOP-GEODOP. Author

N86-19710 New South Wales Univ., Kensington (Australia).
INTEGRATION OF DOPPLER POSITIONING INTO THE GEODETIC NETWORK OF INDONESIA Abstract Only
Chaerul Hafidin 1984 3 p
Avail: Issuing Activity

The Doppler satellite terrestrial coordinate determination was used to establish large control networks and reinforcing existing networks of horizontal control surveys. The preliminary network of Sumatra, Jawa and Nusa Tenggara consists of 407 stations of basically first and second order triangulation. Seventeen Doppler positions are distributed over the network. The preliminary combined adjustments of the Sumatra, Jawa and Nusa Tenggara primary horizontal networks were tested. The adjustments were carried out using the program CHAOS and the method for adjusting networks in sections. This method is mathematically similar to the Helmert block adjustment. The transformation parameters, from the Doppler System (WGS-72) into the terrestrial system (GRS-67) were determined using the PARM program, which follows the Bursa model transformation. The adjusting and transformation results are analyzed and Systematic differences between Doppler and terrestrial networks are noted. E.A.K.

N86-19711* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR CONTOUR MAPPING USING SYNTHETIC APERTURE RADAR Patent
Richard M. Goldstein (JPL, Pasadena, Calif.), Edward R. Caro (JPL, Pasadena, Calif.), and Chialin Wu, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 5 Jan. 1985 8 p Sponsored by NASA
(NASA-Case-NPO-15939-1; US-Patent-4,551,724;
US-Patent-Appl-SN-465365; US-Patent-Class-343-5-CM;
US-Patent-Class-343-5-CD; US-Patent-Class-343-5-VQ;
US-Patent-Class-367-88) Avail: US Patent and Trademark Office
CSCL 08B

By using two SAR antennas spaced a known distance, B, and oriented at substantially the same look angle to illuminate the same target area, pixel data from the two antennas may be compared in phase to determine a difference delta phi from which a slant angle theta is determined for each pixel point from an equation Delta phi = (2 pi B/lambda)sin(theta - alpha), where lambda is the radar wavelength and alpha is the roll angle of the aircraft. The height, h, of each pixel point from the aircraft is determined from the equation h = R cos theta, and from the known altitude, a, of the aircraft above sea level, the altitude (elevation), a', of each point is determined from the difference a - h. This elevation data may be displayed with the SAR image by, for example, quantizing the elevation at increments of 100 feet starting at sea level, and color coding pixels of the same quantized elevation. The distance, d, of each pixel from the ground track of the aircraft used for the display may be determined more accurately from the equation d = R sin theta.

Official Gazette of the U.S. Patent and Trademark Office

N86-19712 Purdue Univ., West Lafayette, Ind.
PRECISION FEATURE LOCATION IN DIGITIZED IMAGERY Ph.D. Thesis
Mark Leavitt Akey 1985 193 p
Avail: Univ. Microfilms Order No. DA8519972

Methods for the precision location of features in digitized imagery are developed. These features include one- and two-dimensional grey level step edges and two-dimensional objects. A new moment based edge locator is developed which is able to determine digitized step edges with subpixel accuracy. Under appropriate assumptions, these step edges can be located with an accuracy limited only by the signal-to-noise ratio and not by the pixel size. In addition, this operator can be used as an edge detector with excellent results when ompared with other edge detectors. Another method involves using threshold decomposition on a grey level object. The summation of many contour locations from a single object results in accurate subpixel location. Theoretical work shows that the location error arises from two-dimensional corners. Maximum location error bounds are determined for squares, rectangles, and crosses. Maximum location error ranges from 0.06 to 0.10 pixels. Average location error results show that accuracies are in the neighborhood of 0.02 pixels. Dissert. Abstr.

N86-19713*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXCITATION OF THE EARTH'S CHANDLER WOBBLE BY SOUTHERN OSCILLATION/EL NINO, 1900-1979
B. Fong. Chao Sep. 1985 23 p refs
(NASA-TM-86231; Rept-85B0557; NAS 1.15:86231) Avail: NTIS HC A02/MF A01 CSCL 08E

The southern oscillation/El Nino (ENSO) is the single most prominent interannual signal in global atmospheric/oceanic fluctuations. The following question is addressed: how important is the angular momentum carried by ENSO in exciting the Earth's Chandler wobble? The question is attacked through a statistical analysis of the coherence spectra (correlation as a function of frequency) between two data sets spanning 1900 to 1979-the southern oscillation index (SOI) time series and the excitation function psi (with x-component psi sub x and y-component psi sub y) of the Chandler wobble derived from the homogeneous ILS (International Latitude Service) polar motion data. The coherence power and phase in the Chandler frequency band (approx. 0.79 to 0.89 cpy) are studied. It is found that, during 1900 to 1979 the coherence between SOI and psi sub x is significant well over the 95% confidence threshold whereas that between SOI and psi sub y is practically nil. Quantitatively, the coherence study shows that ENSO provides some 20% of the observed Chandler wobble excitation power. Since earlier investigations have shown that the total atmospheric/oceanic variation can account for the Chandler wobble excitation at about 20% level, the implication is that ENSO maybe an important (interannual) part of the atmospheric/oceanic variation that is responsible for the Chandler wobble excitation during 1900 to 1979. Author

N86-19714 Purdue Univ., West Lafayette, Ind.
PARAMETER SPACE TECHNIQUES FOR TEMPORAL IMAGE REGISTRATION Ph.D. Thesis
Paul Edward Anuta 1985 214 p
Avail: Univ. Microfilms Order No. DA8519974

The purpose of this research is to investigate the use of parameter space techniques for achieving registration between images which have undergone significant change due to temporal effects of the environment. The parameter space method investigated in this thesis uses the Hough transform to create a new type of image which is used to find intersections of lines to be used as control points for registration. This method can identify linear intersections regardless of rotation and other low order distortions. Two other methods for achieving image registration are studied. The first is conventional block correlation of image pairs to determine translational shift. The second is block correlation of edge images derived from the original images. The three methods are evaluated analytically but comparison on a standard basis became difficult due to the nonlinearity of the methods. A random image simulation algorithm was implemented which allowed evaluation of all three methods under the same conditions. Dissert. Abstr.

N86-19715# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
K SUB 0-BEHAVIOR OF NORMALLY CONSOLIDATED FINE-GRAINED SOILS DURING ONE-DIMENSIONAL SECONDARY COMPRESSION AGING AND THE QUANTITATIVE PREDICTION OF THE QUASI-PRECONSOLIDATION EFFECT Ph.D. Thesis - Florida Univ.
R. W. Brown Aug. 1985 158 p Sponsored in part by National Science Foundation
(AD-A160822; AFIT/CI/NR-85-137D) Avail: NTIS HC A08/MF A01 CSCL 08/13

No consensus and little experimental evidence exist in the geotechnical engineering community regarding k sub 0 behavior of normally consolidated fine-grained soils during one-dimensional secondary compression aging and the origin and magnitude of the quasi-preconsolidation effect. After reviewing several concepts, a control volume triaxial-type test cell with support systems was developed. This equipment allows the maintenance and measurement of the k sub 0 condition during consolidation. Design considerations, development history, and performance parameters for the system are provided. Six normally consolidated fine-grained specimens, three Edgar Plastic Kaolinite and three Agsco novaculite, were allowed to age a minimum of 14 days under a 2 tsf vertical stress while the k sub 0 condition was maintained and measured. The specimens were loaded in small increments following aging to determine if the quasi-preconsolidation effect had developed. Results show k sub 0 decreases during secondary aging in one-dimensional compression for normally consolidated fine-grained soils. Moreover, the quasi-preconsolidation effect develops in both cohesive and cohesionless fine-grained soils. This suggests the quasi-preconsolidation effect develops due to increased friction rather than bonding as previously proposed. Finally, results indicate the existing theory for predicting the magnitude of the quasi-preconsolidation effect needs further refinement. GRA

N86-19716# Advanced Information and Decision Systems, Mountain View, Calif.
LINEAR FEATURE EXTRACTION FROM RADAR IMAGERY Final Report, 11 Sep. 1984 - 30 Jun. 1985
Daryl T. Lawton, Jay Glicksman, Gary D. Conner, and Robert J. Drazovich Sep. 1985 149 p
(Contract DACW72-84-C-0014)
(AD-A161154; AI/DS-TR-3075-01; ETL-0405) Avail: NTIS HC A07/MF A01 CSCL 17/9

This report summarizes a feasibility study performed by AI&DS to determine the requirements for the extraction of linear features such as roads, rivers, and environmental region boundaries from SAR aerial imagery. The effort has involved determining effective processes for extracting such features by algorithm surveys, hand processing sample imagery, and algorithm implementation. This work has provided the necessary basis for the implementation of an intelligent, automated system in Phase 2 of this research. We have designed a general vision system for linear feature extraction which can be generalized to a wide range of SAR (and other sensor) objects, and begun developments of the components of such a system. Author (GRA)

N86-19717# Geological Survey, Reston, Va.
ANNOTATED BIBLIOGRAPHY OF COAL IN THE CARIBBEAN REGION
Randall C. Orndorff 1985 32 p ref
(TI86-900020; USGS-OFR-85-110) Avail: NTIS HC A03/MF A01

The purpose of preparing an annotated bibliography was to compile information on coal localities for the Caribbean region used for preparation of a coal map of the region. Also, it serves as a brief reference list of publications for future coal studies in the Caribbean region. It is in no way an exhaustive study or complete listing of coal literature for the Caribbean. All the material was gathered from published literature with the exception of information from Cuba which was supplied from a study by Gordon Wood of the U.S. Geological Survey, Branch of Coal Resources. The literature ranges from 1857 to 1981. The countries listed include Colombia, Mexico, Venezuela, Cuba, the Dominican Republic, Haiti, Jamaica, Puerto Rico, and the countries of Central America. DOE

N86-19718# Pacific Northwest Lab., Richland, Wash.
INVESTIGATIONS OF SENSITIVITY AND UNCERTAINTY IN SOME HYDROLOGIC MODELS OF YUCCA MOUNTAIN AND VICINITY
E. A. Jacobson, M. D. Freshley, and F. H. Dove Oct. 1985 126 p refs
(Contract DE-AC04-76DP-00789)
(DE86-002091; SAND-84-7212; PNL-5306) Avail: NTIS HC A07/MF A01

The uncertainty in travel time for water through unsaturated and saturated zones of Yucca Mountain and vicinity was determined by considering uncertainty associated with input parameters to the hydrologic models of these zones. A first-order analysis was used to investigate uncertainty in water travel time through the unsaturated zone at Yucca Mountain, based on an analytic solution for water flow. Results of the investigation of uncertainty for the unsaturated zone indicated that uncertainty in the percolation estimate contributed significantly more to uncertainty in travel time than uncertainty in estimates of hydraulic conductivity. Monte Carlo and first-order approaches were used to investigate uncertainty in ground-water travel time for different cases that varied in the treatment of the input parameters to the hydrologic model of the unsaturated zone. Comparison of the Monte Carlo and first-order estimates of mean ground-water travel and travel time uncertainty in the saturated zone demonstrates that the first-order approach underestimated both the mean and variance of travel time for all considered. This underestimation suggests that the Monte Carlo approach should be used to estimate mean travel and its variance as well as the probability density distribution of travel time. A sensitivity study of ground-water travel time in the standard zone indicated that the zones with smaller transmissivity produced the largest influence in travel time for most cases. DOE

N86-19719# Instituut voor Culturtechniek en Waterhuishouding, Wageningen (Netherlands).
A NEW GEOPHYSICAL APPROACH USING REMOTE SENSING TECHNIQUES TO STUDY GROUND WATER TABLE DEPTHS AND REGIONAL EVAPORATION FROM AQUIFERS IN DESERTS
M. Menenti 1983 20 p refs Presented at International Symposium on Methods and Instrumentation of Ground Water Systems, Noordwijkerhout, Netherlands, May 1983
(B8469378) Avail: NTIS HC A02/MF A01; Inst. voor Cultuurtechniek en Waterhuishouding, Wageningen, Netherlands Hfl 5

Two methods to determine variables relevant to the appraisal of ground water resources are presented. It is shown that the properties and thickness of the different soil layers can be

inferred from the thermal behavior of the soil surface. An application of remotely sensed thermal infrared data to estimate shallow groundwater table depths is presented. A method dealing with the determination of actual evaporation in large regions by combining visible and thermal infrared data with ground measurements is discussed. Author (ESA)

N86-19720# Illinois State Geological Survey, Champaign.
GEOLOGY, HYDROLOGY AND WATER QUALITY OF THE CAMBRIAN AND ORDOVICIAN SYSTEMS IN NORTHERN ILLINOIS
A. P. Visocky, M. G. Sherrill, and K. Cartwright 1985 147 p refs Prepared in cooperation with Geological Survey, Urbana, Ill. and Illinois State Water Survey, Champaign, Ill.
(PB85-249795; IL/SGS/COOP-10) Avail: NTIS HC A07/MF A01 CSCL 08H

Cambrian and Ordovician strata provide much of the groundwater supply for approximately 250 municipalities and 150 industries in the northern half of Illinois. The cooperative effort of the Illinois State Water Survey, Illinois State Geological Survey, and U.S. Geological Survey provided a current hydrogeologic evaluation of the water resource. GRA

N86-19696# Helsinki Univ. of Technology, Espoo (Finland).
MAPPING OF SNOW BY PASSIVE AND ACTIVE MICROWAVE SENSORS
M. Hallikainen and R. Kuittinen (Technical Research Centre of Finland, Espoo) *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 131-132 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19697# Innsbruck Univ. (Austria). Inst. of Meteorology and Geophysics.
MONITORING OF SNOW AND LAND ICE PARAMETERS: POSSIBILITIES AND CONSTRAINTS OF SAR AND MICROWAVE IMAGING SYSTEMS
H. Rott *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 133-135 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-20192# Joint Publications Research Service, Arlington, Va.
SIMULTANEOUS OBSERVATIONS OF LONGITUDINAL CURRENTS, STREAMS OF CHARGED PARTICLES AND IONOSPHERIC GLOW DURING POLAR SUBSTORM OF 30 DECEMBER 1981 BY ARTIFICIAL EARTH SATELLITE INTERCOSMOS-BOLGARIYA-1300 Abstract Only
L. N. Zhuzgov, Z. N. Zaytsev, A. K. Kuzmin, V. I. Lazarev, V. O. Papitashvili, V. G. Petrov, M. V. Teltsov, L. O. Tyurmina, V. A. Sharova, and S. I. Shkolnikova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 88 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow, USSR), v. 25, no. 2, Mar. - Apr. 1985 p 328-331 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20193# Joint Publications Research Service, Arlington, Va.
COMPARISON OF THREE SATELLITE MODELS OF MAIN GEOMAGNETIC FIELD Abstract Only
N. P. Benkova and G. I. Kolomiytseva *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 89 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow, USSR), v. 25, no. 2, Mar. - Apr. 1985 p 343-345 Original language was announced in IAA as A85-32840 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20219# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 1: METHODS AND FIRST RESULTS Abstract Only
D. Oertel, V. I. Moroz, I. Nopirakovskiy, V. M. Linkin, H. Jahn, R. S. Kremnev, H. Becker-Ross, W. Stadthaus, V. V. Kerzhanovich, I. A. Matsygorin et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 115 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 191-205 Original language document was announced in IAA as A85-35235 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20220# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 2: PRELIMINARY RESULTS OF TEMPERATURE PROFILE RETRIEVAL Abstract Only
D. Spankuch, L. V. Zasova, K. Schafer, Ye. A. Ustinov, Yu. Gyuldner, V. I. Moroz, W. Dohler, V. M. Linkin, R. Dyubua, A. V. Dyachkov et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 116 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 206-220 Original language document was announced in IAA as A85-35236 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20221# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 3: SOME CONCLUSIONS ON CLOUD STRUCTURE BASED ON ANALYSIS OF SPECTRA Abstract Only
L. V. Zasova, D. Spankuch, V. I. Moroz, K. Schafer, Ye. A. Ustinov, W. Dohler, V. M. Linkin, D. Oertel, A. V. Dyachkov, H. Becker-Ross et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 117 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 221-235 Original language document was announced in IAA as A85-35237 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20222# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 4: PRELIMINARY RESULTS OF ANALYSIS OF SPECTRA IN REGION OF H2O AND SO2 ABSORPTION BANDS Abstract Only
V. I. Moroz, W. Dohler, Ye. A. Ustinov, K. Schafer, L. V. Zasova, D. Spankuch, A. V. Dyachkov, R. Dyubua, V. M. Linkin, D. Oertel et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 118 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 236-247 Original language document was announced in IAA as A85-35238 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20223# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 5: PRELIMINARY RESULTS OF ANALYSIS OF BRIGHTNESS TEMPERATURE AND HEAT FLOW FIELDS Abstract Only
V. M. Linkin, K. Schafer, I. A. Matsygorin, W. Dohler, V. I. Morozn, R. Dyubua, A. V. Dyachkov, D. Spankuch, V. V. Kerzhanovich, D. Oertel et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 118-119 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 248-258 Original language document was announced in IAA as A85-35239 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20238# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL-GEOMORPHOLOGICAL INTERPRETATION OF PHOTO IMAGE PATTERNS IN SPACE PHOTOGRAPHS FOR WESTERN PART OF FERGANA VALLEY AND ITS MOUNTAINOUS FRAMEWORK Abstract Only
D. Magzumova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 135 Transl. into ENGLISH from Uzbekskiy Geologicheskiy Zhurnal (Tashkent, USSR), no. 4, Jul. - Aug. 1985 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20239# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF COLOR COORDINATES OF SOME SOILS ACCORDING TO AIRCRAFT MEASUREMENT DATA Abstract Only
K. Ya. Kondratyev, V. V. Kozoderov, P. P. Fedchenko, S. M. Somova, and L. B. Karvovskaya *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 137-138 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 29-40 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20240# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN MAPPING EARTH ON BASIS OF SPACE PHOTOINFORMATION Abstract Only
L. N. Kuleshov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 138 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 41-44 Original language document was announced in IAA as A85-37117 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20241# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL INFORMATION CONTENT OF MULTIZONAL PHOTOGRAPHS Abstract Only
N. A. Yakovlev and S. G. Slutskaya *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 139 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 45-51 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20242# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL INFORMATION CONTENT OF SPACE PHOTOGRAPHS OBTAINED IN DIFFERENT SPECTRAL RANGES IN COURSE OF GOBI-KHANGAI EXPERIMENT (MUSHUGAY-GURVANBOGD TEST RANGE) Abstract Only
V. I. Makarov and G. I. Volchkova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 140 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 52-58 Original language document was announced in IAA as A85-37118 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20243# Joint Publications Research Service, Arlington, Va.
TECTONIC INTERPRETATION OF RESULTS OF INTERPRETATION OF SPACE PHOTOGRAPHS OF THE CAUCASUS Abstract Only
G. A. Mikheyev and M. G. Makarova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 141 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 59-66 (For primary document see N86-20178 10-88)
Avail: NTIS HC A09

N86-20244# Joint Publications Research Service, Arlington, Va.
PRINCIPAL PATTERNS OF MORPHOTECTONIC STRUCTURE OF EASTERN CAUCASUS DETECTED BY REMOTE SENSING METHOD Abstract Only
B. A. Budagov, A. A. Mikailov, A. S. Aliyev, and E. K. Alizade *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 142 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 67-72 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20245# Joint Publications Research Service, Arlington, Va.
AUTOMATED SPECTRAL ANALYSIS OF DIMENSIONS AND DIRECTIONS OF STRUCTURAL ELEMENTS ON EARTH'S SURFACE Abstract Only
D. K. Tkhabisimov, D. A. Uiskov, and M. I. Kolsenik *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 143 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 3-80 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20246# Joint Publications Research Service, Arlington, Va.
USE OF MATERIALS FROM LARGE-SCALE AERIAL PHOTOSURVEY OF FOREST IN AUTOMATED INTERPRETATION OF SPACE PHOTOGRAPHS Abstract Only
L. A. Kuzenkov, N. A. Aparinova, and A. V. Starchenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 143-144 Transl. into ENGLISH from Isledovaniye Zemli iz Kosmosa(Moscow, USSR), no. 2, Mar. - Apr. 1985 p 90-96 Original language document was announced in IAA as A85-37119 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20247# Joint Publications Research Service, Arlington, Va.
CHOICE OF CONDITIONS FOR AEROSPACE SURVEY IN VISIBLE SPECTRAL RANGE FOR DETERMINING ALBEDO OF OBJECT AND BACKGROUND Abstract Only
A. B. Karasev and S. V. Pantyukhov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 144-145 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 97-107 Original language document was announced in IAA as A85-37120 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20248# Joint Publications Research Service, Arlington, Va.
SYSTEM OF CRITERIA FOR ANALYSIS AND RECOGNITION OF IMAGES OF RANDOM SPATIAL TEXTURES Abstract Only
O. V. Bazarskiy and Yu. V. Korzhik *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 145-146 Transl. into ENGLISH from Issledovaniya Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 108-110 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20249# Joint Publications Research Service, Arlington, Va.
RATIONALIZATION OF SYSTEM FOR ACQUISITION OF OZONE REMOTE MEASUREMENT DATA IN NORTHERN HEMISPHERE Abstract Only
O. M. Pokrovskiy and A. K. Malygina *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 146 Transl. into ENGLISH from Issledovaniya Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 10-16 Original language document was announced in IAA as A85-29901 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20252# Joint Publications Research Service, Arlington, Va.
POSSIBILITIES OF USE OF REMOTE METHODS FOR INCREASING EFFICIENCY OF PETROLEUM AND GAS EXPLORATION WORK Abstract Only
M. Kh. Ishanov, V. A. Yushin, A. K. Gayazova, and G. N. Malashenkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 148-149 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), n. 1, Jan. - Feb. 1985 p 39-46 Original language document was announced in IAA as A85-29905 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20253# Joint Publications Research Service, Arlington, Va.
DETERMINING WATER SURFACES IN NORTHWESTERN BOHEMIA FROM SATELLITE DATA Abstract Only
K. Kirchner, J. Kolar, and S. Plachy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 149 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 47-51 Original language document was announced in IAA as A85-29906 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20254# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE DESERTIFICATION MAPS AND METHODOLOGY FOR THEIR COMPILATION USING SPACE PHOTOGRAPHS Abstract Only
N. G. Kharin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 150 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 52-59 Original language document was announced in IAA as A85-29907 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20255# Joint Publications Research Service, Arlington, Va.
USE OF SPACE METHODS FOR STUDYING SALINE SOILS AND SOLONCHAKS Abstract Only
E. A. Mamedov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 151 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 60-65 Original language document was announced in IAA as A85-29908 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20256# Joint Publications Research Service, Arlington, Va.
DETERMINING SOIL MOISTURE CONTENT BY MICROWAVE RADIOMETRY METHOD USING A PRIORI INFORMATION Abstract Only
Ye. A. Reutov and A. M. Shutko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 152 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 73-87 Original language document was announced in IAA as A85-29910 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20257# Joint Publications Research Service, Arlington, Va.
RADAR MAPPING OF MOISTURE CONTENT OF OPEN SOILS Abstract Only
N. N. Krupenio *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 152-153 Transl. into ENGLISH from Issledovaniya Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 88-93 Original language document was announced in IAA as A85-29911 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20258# Joint Publications Research Service, Arlington, Va.
DISCRIMINATING HOMOGENEOUS REGIONS WITH INCOMPLETE BOUNDARIES ON IMAGE Abstract Only
A. A. Zlatopolskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 153-154 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 94-102 Original language document was announced in IAA as A5-29912 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20259# Joint Publications Research Service, Arlington, Va.
SEGMENTATION OF HALF-TONE AEROSPACE IMAGES BY LEVEL LINES METHOD Abstract Only
D. Ye. Minskiy and M. M. Feygin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 154 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 103-112 Original language document was announced in IAA as A85-29913 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20260# Joint Publications Research Service, Arlington, Va.
USE OF A PRIORI EVALUATION OF CONDITIONS FOR OBSERVING EARTH'S SURFACE FROM SPACE FOR EFFECTIVE CHOICE OF TIME FOR EXECUTING SURVEY Abstract Only
N. V. Kapitonova and Ye. L. Lukashevich *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 155 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 113-117 Original language document was announced in IAA as A85-29914 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20261# Joint Publications Research Service, Arlington, Va.
AEROSPACE OBSERVATIONS OF ADVECTIVE-EDDY FORMATIONS IN CENTRAL BALTIC SEA Abstract Only
I. A. Bychkova, S. V. Viktorov, V. V. Vinogradov, V. N. Losinskiy, and Kh. Yu. Brosin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 156 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 118-122 Original language document was announced in IAA as A85-29915 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20262# Joint Publications Research Service, Arlington, Va.
FEATURES IN ALLOWANCE FOR ATMOSPHERIC INFLUENCE IN VERY LONG BASELINE RADIOINTERFEROMETRY Abstract Only
N. S. Zabolotnyy and G. A. Shanurov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 157 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 3-8 Original language document was announced in IAA as A85-19994 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20263# Joint Publications Research Service, Arlington, Va.
DETERMINING GEOCENTRIC GRAVITATIONAL CONSTANT BY SPACE GEODESY METHODS Abstract Only
Yu. V. Plakhov and A. V. Paramzin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 157-158 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 46-53 Original language document was announced in IAA as A85-19995 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20264# Joint Publications Research Service, Arlington, Va.
DETERMINING ELEMENTS OF OUTER ORIENTATION OF AEROSPACE PHOTOGRAPHS IN REMOTE STUDY OF DYNAMIC PROCESSES AND PHENOMENA Abstract Only
V. B. Dubinovskiy and A. A. Morozov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 158-159 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 66-70 Original language document was announced in IAA as A85-19998 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20265# Joint Publications Research Service, Arlington, Va.
PREDICTING COORDINATE ERRORS OF PHOTOGRAPH POINTS Abstract Only
V. G. Yelyushkin and B. V. Pronin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 159 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Feodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 70-75 Original language document was announced in IAA as A85-19999 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20266# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF CARRIER ORIENTATION ERRORS ON IMAGE MOTION IN PHOTOGRAPHY FROM MOVING OBJECT Abstract Only
B. M. Miller and G. I. Fedchenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 160 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 75-80 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20268# Joint Publications Research Service, Arlington, Va.
DYNAMIC AEROSPACE SENSING (CONTENT, PROBLEMS, FIELD OF APPLICABILITY) Abstract Only
Yu. F. Knizhnikov *In its* USSR Report: Space (JPRS-USP-86-001)

13 Jan. 1986 p 161-162 Transl. into ENGLISH form Vestnik Moskovskogo Universiteta, Seriya 5: Geografiya (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 7-13 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20269# Joint Publications Research Service, Arlington, Va.
PRINCIPAL PHOTOGRAMMETRIC DEPENDENCES IN PROCESSING OF RADAR SURVEY MATERIALS Abstract Only
Yu. S. Tyuflin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 162 Transl. into ENGLISH from Geodeziya i Kartografiya (Moscow, USSR), no. 9, Sep. 1984 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20270# Joint Publications Research Service, Arlington, Va.
MAPPING OF VEGETATION RESOURCES OF ARID ZONES USING SPACE PHOTOINFORMATION Abstract Only
V. S. Khrutskiy Transl. into ENGLISH from Geodeziya i Kartografiya (Moscow, USSR), no. 9, Sep. 1984 p 51-56 Original language document was announced in IAA as A85-14322 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N86-19721* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEGATIVE ELECTRODE CATALYST FOR THE IRON CHROMIUM REDOX ENERGY STORAGE SYSTEM Patent
Randall F. Gahn and Norman H. Hagedorn, inventors (to NASA) Issued 24 Sep. 1985 7 p Filed 20 Aug. 1984
(NASA-Case-LEW-14028-1; US-Patent-4,543,302; US-Patent-Appl-SN-642310; US-Patent-Class-429-15; US-Patent-Class-429-19; US-Patent-Class-429-51; US-Patent-Class-429-109) Avail: US Patent and Trademark Office CSCL 10C

A redox cell which operates at elevated temperatures and which utilizes the same two metal couples in each of the two reactant fluids is disclosed. Each fluid includes a bismuth salt and may also include a lead salt. A low cost, cation permselective membrane separates the reactant fluids.

Official Gazette of the U.S. Patent and Trademark Office

N86-19722 Virginia Univ., Charlottesville.
CHLOROPHYLL SENSITIZED SOLAR CELLS Ph.D. Thesis
David Frankie Glenn 1984 109 p
Avail: Univ. Microfilms Order No. DA8515498

The photovoltaic properties of the green plant pigment chlorophyll-a (Chl-a) were investigated in photoelectrochemical and solid state solar cells. Both types of cells utilized a thin film of Chl-a electro-deposited on a SnO2 optically transparent electrode. Solid state cells were fabricated by vapor depositing a thin layer of metal on top of the Chl-A to produce a SnO2/Chl-a/metal sandwich cell. Photoelectrochemical cells were assembled by immersing the SnO2/Chl-a electrode in an aqueous electrolyte solution along with a counter electrode. Both types of Chl-a cells were generally characterized by a strong dependence of he photoactivity on the other cell components and a surprisingly large photovoltage. Photoelectrochemical cells of SnO2/I-a/aq.AlCl3 were seen to produce photovoltages as high as 1.1 V and photocurrents of 1.1 micro A/sq cm while a solid state cell of SnO2/Chl-a/Al could produce 1.4 V and an initial photocurrent of 200 micro A/sq cm. This photoactivity was strongly time dependent in both configurations. Despite this fact, these cells are the most powerful Chl-a sensitized solar cells yet reported. Dissert. Abstr.

N86-19723*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE FLAT-PLATE SOLAR ARRAY PROJECT WORKSHOP ON CRYSTAL GOWTH FOR HIGH-EFFICIENCY SILICON SOLAR CELLS
Katherine A. Dumas, ed. 15 Aug. 1985 296 p refs Workshop held in San Diego, Calif., 3-4 Dec. 1984
(Contract NAS7-918; JPL-5101-272; Contract DE-AI01-76ET-20356)
(NASA-CR-176540; DOE/JPL-1012-109; NAS 1.26:176540) Avail: NTIS HC A13/MF A01 CSCL 10B

A Workshop on Crystal Growth for High-Efficiency Silicon Solar Cells was held December 3 and 4, 1984, in San Diego, California. The Workshop offered a day and a half of technical presentations and discussions and an afternoon session that involved a panel discussion and general discussion of areas of research that are necessary to the development of materials for high-efficiency solar cells. Topics included the theoretical and experimental aspects of growing high-quality silicon crystals, the effects of growth-process-related defects on photovoltaic devices, and the suitability of various growth technologies as cost-effective processes. Fifteen invited papers were presented, with a discussion period following each presentation. The meeting was organized by the Flat-Plate Solar Array Project of the Jet Propulsion Laboratory. These Proceedings are a record of the presentations and discussions, edited for clarity and continuity. For individual titles, see N86-19724 through N86-19738. Author

N86-19724*# Pennsylvania Univ., Philadelphia.
MATERIALS REQUIREMENTS FOR HIGH-EFFICIENCY SILICON SOLAR CELLS
M. Wolf *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 3-15 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

To achieve higher Si solar cell efficiencies (greater than 20%), better single-crystal Si must be produced. It is believed possible to bring Cz (Czochralski) Si up to the same low recombination level as FZ (Float Zone) Si. It is also desirable that solar cell Si meet the following requirements: long minority carrier lifetime (0.2 ohm-cm p-type with tau less than 500 microsec); repeatedly uniform lifetime (not spread from 50 to 1000 microsec); a lifetime that does not decrease during normal device processing; a silicon wafer sheet that is flat and stays throughout normal device processing; uniform and reasonable mechanical strength; and, manufacture at low cost (less than $50/sq m). F.M.R.

N86-19725*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
THE STATUS OF SILICON RIBBON GROWTH TECHNOLOGY FOR HIGH-EFFICIENCY SILICON SOLAR CELLS
T. F. Ciszek *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 17-28 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

More than a dozen methods have been applied to the growth of silicon ribbons, beginning as early as 1963. The ribbon geometry has been particularly intriguing for photovoltaic applications, because it might provide large area, damage free, nearly continuous substrates without the material loss or cost of ingot wafering. In general, the efficiency of silicon ribbon solar cells has been lower than that of ingot cells. The status of some ribbon growth techniques that have achieved laboratory efficiencies greater than 13.5% are reviewed, i.e., edge-defined, film-fed growth (EFG), edge-supported pulling (ESP), ribbon against a drop (RAD), and dendritic web growth (web). Author

N86-19726*# Shin-Etsu handotai Co., Vancouver, Wash.
FUTURE APPLICATION OF CZOCHRALSKI CRYSTAL PULLING FOR SILICON
J. H. Matlcok *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 29-54 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Czochralski (Cz) crystal pulling has been the predominant method used for preparing silicon single crystal for the past twenty years. The fundamental technology used has changed little. However, great strides have been made in learning how to make the crystals bigger and of better quality at ever increasing productivity rates. Currently charge sizes of 50 kg of polycrystal silicon are being used for production and crystals up to ten inches in diameter have been grown without major difficulty. The largest material actually being processed in silicon wafer form is 150 mm (6 inches) in diameter. Growing of crystals in a magnetic field has proved to be particularly useful for microscopic impurity control. Major developments in past years on equipment for Cz crystal pulling have included the automatic growth control of the diameter as well as the starting core of the crystal, the use of magnetic fields and around the crystal puller to supress convection, various recharging schemes for dopant control and the use of continuous liquid feed in the crystal puller. The latter, while far from being a reliable production process, is ideal in concept for major improvement in Cz crystal pulling. The Czochralski process will maintain its dominance of silicon crystal production for many years. F.M.R.

N86-19727*# Shin-Etsu handotai Co., Gumma (Japan).
POTENTIAL PRODUCTIVITY BENEFITS OF FLOAT-ZONE VERSUS CZOCHRALSKI CRYSTAL GROWTH c76
Takao Abe *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 55-80 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Efficient mass production of single-crystal silicon is necessary for the efficient silicon solar arrays needed in the coming decade. However, it is anticipated that there will be difficulty growing such volumes of crystals using conventional Czochralski (Cz) methods. While the productivity of single crystals might increase with a crystal diameter increase, there are two obstacles to the mass production of large diameter Czochralski crystals, the long production cycle due to slow growth rate and the high heat requirements of the furnaces. Also counterproductive would be the large resistivity gradient along the growth direction of the crystals due to impurity concentration. Comparison between Float zone (FZ) and Cz crystal growth on the basis of a crystal 150 mm in diameter is on an order of two to four times in favor of the FZ method. This advantage results from high growth rates and steady-state growth while maintaining a dislocation-free condition and impurity segregation. F.M.R.

N86-19728*# Massachusetts Inst. of Tech., Cambridge.
NEW OUTLOOK ON CONTROL OF CRYSTALLINE AND CHEMICAL PERFECTION DURING GROWTH OF SILICON c76
A. F. Witt *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 83-96 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Significant progress has been made in our understanding of the Czochralski crystal growth process with the realization that the incorporation of oxygen into silicon is directly related to the internal gettering capability of wafers during device fabrication. It was also recognized that the electronic properties exhibited by silicon during various stages of device fabrication were significantly affected by the thermal history of the silicon during the post-growth cool-down period. Turbulent melt convection, induced by unavoidable destabilizing thermal gradients, was found to interfere with homogeneous dopant (and oxygen) incorporation and to influence markedly the dynamics of nonequilibrium point defects in the solidified silicon matrix during the cool-down period. In view of the unavoidability of destabilizing thermal gradients in conventional crystal growth configurations, melt stabilization through the application of magnetic fields is generally considered a viable approach. Control of heat input to the melt through heat pipe systems, as used during growth of germanium, cannot be applied to industrial growth of silicon. Recent studies have shown that heat exchange systems located coaxially about a growing crystal can be used to stabilize and control not only heat transfer in the grown crystal, but also in the melt adjacent to the solidification interface. F.M.R.

N86-19729*# International Business Machines Corp., Hopewell Junction, N. Y.
MCZ: STRIATIONS IN CZ SILICON CRYSTALS GROWN UNDER VARIOUS AXIAL MAGNETIC FIELD STRENGTHS c76
George K. M. Kim *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 97-107 refs (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Suppression of fluid flow instabilities in the melt by the axial magnetic field in Czochralski silicon crystal growth (AMCZ) is investigated precisely by a high-sensitivity striation etching in conjunction with temperature measurements. The magnetic strength (B) was varied up to 4.0 kG, incremented in 0.5 kG/5 cm crystal length. The convection flow was substantially suppressed at $B > 1.0$ kG. A low oxygen level of 2-3 ppma and a high resistivity of 400 ohm-cm is achieved in the AMCZ silicon crystals at $B > 1.0$ kG. Details of the striation formation as a function of B are presented. Computer simulation of the magnetohydrodynamics of the AMCZ silicon crystal growth are discussed briefly with regard to the solute, especially oxygen segregation at $B=0$, 1.0, and 2.0 kG. Earlier studies in the inverted Bridgman growth of InSb and Ge, which have established the cause and effect relationship between the convection in the melt and the striation formation as well as the suppression of the convections in the melt by transverse magnetic field are reviewed. Author

N86-19730*# Hughes Research Labs., Malibu, Calif.
HIGH PURITH LOW DEFECT FZ SILICON c76
H. Kimura and G. Robertson *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 109-121 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The most common intrinsic defects in dislocation-free float zone (FZ) silicon crystals are the A- and B-type swirl defects. The mechanisms of their formation and annihilation have been extensively studied. Another type of defect in dislocation-free FZ crystals is referred to as a D-type defect. Concentrations of these defects can be minimized by optimizing the growth conditions, and the residual swirls can be reduced by the post-growth extrinsic gettering process. Czochralski (Cz) silicon wafers are known to exhibit higher resistance to slip and warpage due to thermal stress than do FZ wafers. The Cz crystals containing dislocations are more resistant to dislocation movement than dislocated FZ crystals because of the locking of dislocations by oxygen atoms present in the Cz crystals. Recently a transverse magnetic field was applied during the FZ growth of extrinsic silicon. Resultant flow patterns, as revealed by striation etching and spreading resistance in Ga-doped silicon crystals, indicate strong effects of the transverse magnetic field on the circulation within the melt. At fields of 5500 gauss, the fluid flow in the melt volume is so altered as to affect the morphology of the growing crystal. F.M.R.

N86-19731*# RCA Labs., Princeton, N. J.
DEFECTS IN SILICON EFFECT ON DEVICE PERFORMANCE AND RELATIONSHIP TO CRYSTAL GROWTH CONDITIONS c76
L. Jastrzebski *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 123-143 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

A relationship between material defects in silicon and the performance of electronic devices will be described. A role which oxygen and carbon in silicon play during the defects generation process will be discussed. The electronic properties of silicon are

a strong function of the oxygen state in the silicon. This state controls mechanical properties of silicon efficiency for internal gettering and formation of defects in the device's active area. In addition, to temperature, time, ambience, and the cooling/heating rates of high temperature treatments, the oxygen state is a function of the crystal growth process. The incorporation of carbon and oxygen into silicon crystal is controlled by geometry and rotation rates applied to crystal and crucible during crystal growths. Also, formation of nucleation centers for oxygen precipitation is influenced by the growth process, although there is still a controversy which parameters play a major role. All these factors will be reviewed with special emphasis on areas which are still ambiguous and controversial. Author

N86-19732*# Washington Univ., St. Louis, Mo.
SIMULATION OF THE TEMPERATURE DISTRIBUTION IN CRYSTALS GROWN BY CZOCHRALSKI METHOD c76
M. P. Dudokovic and P. A. Ramachandran *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 147-173 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Production of perfect crystals, free of residual strain and dislocations and with prescribed dopant concentration, by the Czochralski method is possible only if the complex, interacting phenomena that affect crystal growth in a Cz-puller are fully understood and quantified. Natural and forced convection in the melt, thermocapillary effect and heat transfer in and around the crystal affect its growth rate, the shape of the crystal-melt interface and the temperature gradients in the crystal. The heat transfer problem in the crystal and between the crystal and all other surfaces present in the crystal pulling apparatus are discussed at length. A simulation and computer algorithm are used, based on the following assumptions: (1) only conduction occurs in the crystal (experimentally determined conductivity as a function of temperature is used), (2) melt temperature and the melt-crystal heat transfer coefficient are available (either as constant values or functions of radial position), (3) pseudo-steady state is achieved with respect to temperature gradients, (4) crystal radius is fixed, and (5) both direct and reflected radiation exchange occurs among all surfaces at various temperatures in the crystal puller enclosure. Author

N86-19733*# Arizona State Univ., Tempe.
CONVECTIVE EFFECTS IN FLOAT-ZONE AND CZOCHRALSKI MELTS c76
G. P. Neitzel *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1986 p 175-192 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The hydrodynamics of crystal-growth melts is a relatively new research area. Numerical modeling of these processes is necessary. The work discussed herein is in two parts: numerical simulations of the flow in a Czochralski melt, and also of that in a float zone. In addition, for the float-zone case, energy stability theory will be used to determine stability bounds for the onset of oscillatory thermo-capillary flow. Convective effects in crystal-growth melts arise from a variety of mechanisms. Temperature gradients both in the direction of gravity and normal to it give rise to convection due to buoyancy effects. Rotation of the crucible and/or crystal causes a forced convection which may augment or oppose the buoyancy-driven flow. Finally, thermo-capillary forces (due to the variation of surface tension with temperature) drive surface motions which in turn generate convection in the bulk fluid. All of these mechanisms are present in either Czochralski or float-zone growth. The objective of the Czochralski modeling is to develop an accurate numerical simulation of the flow in a Czochralski silicon melt and to investigate the effects of various parameters on the flow properties. Like some earlier investigations, the intent is to simulate the effects of buoyancy, forced and thermo-capillary convection, including unsteady effects. Unlike earlier work, the aim is to include the effects of a variable free surface and freezing interface and, possibly incorporate nonaxisymmetric effects. Author

N86-19734*# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
THERMAL-CAPILLARY MODEL FOR CZOCHRALSKI GROWTH OF SEMICONDUCTOR MATERIALS c76
J. J. Derby and R. A. Brown *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 195-214 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The success of efficiently calculating the temperature field, crystal radius, melt mensicus, and melt/solid interface in the Czochralski crystal growth system by full finite-element solution of the government thermal-capillary model is demonstrated. The model predicts realistic response to changes in pull rate, melt volume, and the thermal field. The experimentally observed phenomena of interface flipping, bumping, and the difficulty maintaining steady-state growth as the melt depth decreases are explained by model results. These calculations will form the basis for the first quantitative picture of Cz crystal growth: The accurate depiction of the melt meniscus is important in calculating the crystal radius and solidification interface. The sensitivity of the results to the equilibrium growth angle place doubt on less sophisticated attempts to model the process without inclusion of the meniscus. Quantitative comparison with experiments should be possible once more representation of the radiation and view factors in the thermal system and the crucible are included. Extensions of the model in these directions are underway. Author

N86-19735*# Westinghouse Research and Development Center, Pittsburgh, Pa.
IMPURITIES IN SILICON SOLAR CELLS
R. H. Hopkins *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 215-233 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Metallic impurities, both singly and in combinations, affect the performance of silicon solar cells. Czochralski silicon web crystals were grown with controlled additions of secondary impurities. The primary electrical dopants were boron and phosphorus. The silicon test ingots were grown under controlled and carefully monitored conditions from high-purity charge and dopant material to minimize unintentional contamination. Following growth, each crystal was characterized by chemical, microstructural, electrical, and solar cell tests to provide a detailed and internally consistent description of the relationships between silicon impurity concentration and solar cell performance. Deep-level spectroscopy measurements were used to measure impurity concentrations at levels below the detectability of other techniques and to study thermally-induced changes in impurity activity. For the majority of contaminants, impurity-induced performance loss is due to a reduction of the base diffusion length. From these observations, a semi-empirical model which predicts cell performance as a function of metal impurity concentration was formulated. The model was then used successfully to predict the behavior of solar cells bearing as many as 11 different impurities. F.M.R.

N86-19736*# State Univ. of New York, Albany.
OXYGEN AND CARBON IN SILICON c76
J. W. Corbett *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 235-257 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The properties of the early transistors were determined by the minority-carrier lifetime, as is the silicon photovoltaic solar cell. Most of the devices on the modern integrated circuits are majority carrier devices, in part to avoid this lifetime dependence. The micro-electronics industry typically starts with wafers with a minority-carrier lifetime of 1000 micro-seconds, but during device fabrication this lifetime is reduced to beflow 1 micro-second, in spite of extraordinary cleanliness and precautions. Process-induced defects (PID) include point defects, defect complexes, line defects, and bulk precipitates. One of the aspects that needs to be better understood is the nature of minority carrier recombination at line defects and at precipitates. Some of the PIDs are

known to be related to the fast-diffusers of the iron-series transition elements. One of the common techniques of dealing with these elements is intrinsic gettering by the oxygen precipitates. But even in the gettered state, there may be a residual effect on the lifetime. Oxygen is an almost ubiquitous impurity in silicon and plays an important role in both integrated circuits and solar cells. The isolated oxygen interstitial is electrically inactive, but in its various aggregated forms it has a variety of electrical activities. The agglomeration and precipitation of oxygen, including impurity gettering and the complicating role of carbon, is discussed. F.M.R.

N86-19737*# Texas Instruments, Inc., Sherman.
SOLAR CELL AND I.C. ASPECTS OF INGOT-TO-SLICE MECHANICAL PROCESSING **c76**
Lawrence D. Dyer *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 259-277 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

Intensive efforts have been put into the growth of silicon crystals to suit today's solar cell and integrated circuit requirements. Each step of processing the crystal must also receive concentrated attention to preserve the grown-in perfection and to provide a suitable device-ready wafer at reasonable cost. A comparison is made between solar cell and I.C. requirements on the mechanical processing of silicon from ingot to wafer. Specific defects are described that can ruin the slice or can possibly lead to device degradation. These include grinding cracks, saw exit chips, crow's-foot fractures, edge cracks, and handling scratches. Author

N86-19738*# Storti (George), Washington, D.C.
DEFECTS AND DEVICE PERFORMANCE **c76**
George Storti, R. Armstrong, S. Johnson, H. C. Lin, W. Regnault, and K. C. Yoo *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 279-291 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

The necessity for a low-cost crystalline silicon sheet material for photovoltaics has generated a number of alternative crystal growth techniques that would replace Czochralski (Cz) and float-zone (FZ) technologies. Efficiencies of devices fabricated from low resistivity FZ silicon are approaching 20%, and it is highly likely that this value will be superseded in the near future. However, FZ silicon is expensive, and is unlikely ever to be used for photovoltaics. Cz silicon has many of the desirable qualities of FZ except that minority-carrier lifetimes at lower resistivities are significantly less than those of FZ silicon. Even with Cz silicon, it is unlikely that cost goals can be met because of the poor-material yield that results from sawing and other aspects of the crystal rowth. Although other silicon sheet technologies have been investigated, almost all have characteristics that limit efficiency to approx. 16%. In summary, 20% efficient solar cells can likely be fabricated from both FZ and Cz silicon, but costs are likely to be ultimately unacceptable. Alternate silicon technologies are not likely to achieve this goal, but cost per watt figures may be eventually better than either of the single crystal technologies and may rival any thin-film technology. F.M.R.

N86-19739*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH-EFFICIENCY SILICON SOLAR-CELL DESIGN AND PRACTICAL BARRIERS
A. Mokashi 15 Nov. 1985 31 p refs
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-176529; JPL-Pub-85-75; NAS 1.26:176529;
DOE/JPL-1012-112) Avail: NTIS HC A03/MF A01 CSCL 10B

A numerical evaluation technique is used to study the impact of practical barriers, such as heavy doping effects (Auger recombination, band gap narrowing), surface recombination, shadowing losses and minority-carrier lifetime (Tau), on a high efficiency silicon solar cell performance. Considering a high Tau of 1 ms, efficiency of a silicon solar cell of the hypothetical case is estimated to be around 29%. This is comparable with (detailed balance limit) maximum efficiency of a p-n junction solar cell of 30%. Value of Tau is varied from 1 second to 20 micro. Heavy doping effects, and realizable values of surface recombination velocities and shadowing, are then considered in succession and their influence on cell efficiency is evaluated and quantified. These practical barriers cause the cell efficiency to reduce from the maximum value of 29% to the experimentally achieved value of about 19%. Improvement in open circuit voltage V sub oc is required to achieve cell efficiency greater than 20%. Increased value of Tau reduces reverse saturation current and, hence, improves V sub oc. Control of surface recombination losses becomes critical at higher V sub oc. Substantial improvement in Tau and considerable reduction in surface recombination velocities is essential to achieve cell efficiencies greater than 20%. Author

N86-19740*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CHARACTERIZATION OF EMI GENERATED BY THE DISCHARGE OF A VOLT SOLAR ARRAY Final Report
Philip Leung 1 Nov. 1985 24 p refs
(Contract NAS7-918)
(NASA-CR-176537; JPL-Pub-85-82; NAS 1.26:176537) Avail: NTIS HC A03/MF A01 CSCL 10A

The interaction of a high-voltage solar array with the space plasma environment is investigated in a laboratory simulation experiment. Discharges are observed to occur when the solar array is at a sufficiently high negative bias with respect to the plasma. The frequency of occurrence of discharge is found to depend critically on the plasma density and on the geometry of the array. The electromagnetic interference (EMI) associated with a discharge is also measured. The amplitude of EMI increases with the magnitude of the high voltage. Since the discharge-generated EMI is of significant amplitude, its effect on the performance of systems in space must be evaluated. Author

N86-19741*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SENSITIVITY ANALYSIS OF CENTRAL FLAT-PLATE PHOTOVOLTAIC SYSTEMS AND IMPLICATIONS FOR NATIONAL PHOTOVOLTAICS PROGRAM PLANNING
M. R. Crosetti 30 Aug. 1985 65 p refs
(Contracts NAS7-918; DE-AI01-76ET-20356)
(NASA-CR-176526; JPL-Pub-85-92; NAS 1.26:176526;
DOE/JPL-1012-114) Avail: NTIS HC A04/MF A01 CSCL 10B

The sensitivity of the National Photovoltaic Research Program goals to changes in individual photovoltaic system parameters is explored. Using the relationship between lifetime cost and system performance parameters, tests were made to see how overall photovoltaic system energy costs are affected by changes in the goals set for module cost and efficiency, system component costs and efficiencies, operation and maintenance costs, and indirect costs. The results are presented in tables and figures for easy reference. Author

N86-19742*# Georgia Inst. of Tech., Atlanta.
TECHNOLOGY FOR SATELLITE POWER CONVERSION Semiannual Technical Report, 27 May - 26 Oct. 1985
M. A. Gouker, D. P. Campbell, and J. J. Gallagher 29 Jan. 1986 35 p refs
(Grant NAG3-282; GTRI Proj. 3244)
(NASA-CR-176554; NAS 1.26:176554) Avail: NTIS HC A03/MF A01 CSCL 10A

The dipole pattern of the antenna was confirmed and work on the MOM diode began. The antenna - detector structure was modified and the measurement apparatus reconfigured to permit precise antenna pattern measurements. Fabrication of the MOM diode was initiated after antenna action from the new structures was observed. A refined antenna structure was developed. The previous antenna design allowed currents induced by the incident radiation in the bonding wires to flow through the bolometer. The detector was thus responding to both the antenna and bonding wire currents. A low pass filter was added to the antenna structure to improve the detection scheme. The new design uses an

interdigitated capacitor to prevent the induced current in the bonding wires from flowing through the detection element. Author

N86-19743# Naval Surface Weapons Center, Silver Spring, Md.
LOADING AND UTILIZATION OF ACTIVE MATERIAL IN NICKEL COMPOSITE ELECTRODES: OPTIMIZATION
W. W. Lee, W. A. Ferrando, and R. A. Sutula Dec. 1984 56 p (AD-A160354; NSWC/TR-84-122) Avail: NTIS HC A04/MF A01 CSCL 09/1

As an attempt to reduce nickel battery weight, the nickel composite electrode (Ni. C. E.), has been under development. Investigations were undertaken to determine the optimum conditions for loading and utilizing nickel hydroxide active material in nickel composite electrodes. The main emphasis was placed on the improvement of both loading efficiency by electrochemical impregnation and utilization efficiency of the Ni(OH)2 active material. The efficiencies were examined as functions of such electrochemical conditions as current density, nickel concentration, pH, temperature of the impregnating bath, the continuity of current flow and manner of adding Co(OH)2 additive. Also studied was the loading efficiency of chemical impregnation (polarization method) and the suspension method which enables a direct loading of externally prepared active material into the composite body. The most important factor for a quick utilization of the active material was found to be the additive distribution. A model of the additive distribution in the active material is proposed to account for different patterns of utilization exhibited by the electrodes.
GRA

N86-19744# Howard Univ., Washington, D. C.
GALLIUM ARSENIDE SOLAR CELLS
[1985] 17 p
(DE85-011085; DOE/ER-10096/T13) Avail: NTIS HC A02/MF A01

Ga(1-x)Al(x)As was applied in a thin epitaxial layer to increase the efficiency of the solar cells: resulting in negligible optical absorption, low series resistance, prevention of entrance of minority carriers, and low surface recombination velocity at interfaces. The performance of Ga(1-x)Al(x)As/GaAs p-n junction solar cells were improved by studying the effects of doping impurities; thickness and composition of the Ga(1-x)Al(x)As layer, grid pattern design, heat sink design, and antireflection coating. B.G.

N86-19745# Brookhaven National Lab., Upton, N. Y.
ADVANCED MATERIALS FOR GEOTHERMAL ENERGY PROCESSES
L. E. Kukacka Aug. 1985 15 p refs Presented at the Geothermal Program Review, Washington, D.C., 11 Sep. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001183; BNL-36933; CONF-8509142-7) Avail: NTIS HC A02/MF A01

The primary goal of the geothermal materials program is to ensure that the private sector development of geothermal energy resources is not constrained by the availability of technologically and economically viable materials of construction. This requires the performance of long-term high risk GHTD-sponsored materials R and D. Ongoing programs described include high temperature elastomers for dynamic sealing applications, advanced materials for lost circulation control, waste utilization and disposal, corrosion resistant elastomeric liners for well casing, and nonmetallic heat exchangers. DOE

N86-19746*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES, AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Annual Report
P. B. Willis 1985 89 p
(Contracts NAS7-100; JPL-954527)
(NASA-CR-176567; NAS 1.26:176567; DE86-001309; DOE/JPL-954527-27-85-AR-9) Avail: NTIS HC A05/MF A01

Progress in solar energy technology is reported in the following areas: aging and life prediction methodology and devices for solar cell encapsulation; the function of adhesion chemistry, primers, and a new diagnostic technique for estimations of bond durability; a study of fire retardant formulations for decreasing the potential flammability of solar modules; initial studies of the electrical insulating properties of encapsulation materials and measurement of the intrinsic dielectric strength; antisoiling compounds for the prevention of soil build-up on the outer surface of the module; and low temperature processing encapsulants that permit module fabrication at temperatures less than 100 C. Another area of study has been added to determine the degree to which formulation and processes affect the module quality and manufacturing yield.
DOE

N86-19747# Netherlands Energy Research Foundation, Petten. Bureau Voorlichting.
ADDRESSES OF: 1. PRODUCERS AND DEALERS OF WIND TURBINES AND WIND TURBINE BLADES IN THE NETHERLANDS. 2. BUREAUS, INSTITUTIONS AND ASSOCIATIONS IN THE FIELD OF WIND ENERGY [ADRESSEN VAN: 1. PRODUCENTEN EN LEVERANCIERS VAN WINDTURBINES EN WINDTURBINEBLADEN IN NEDERLAND. 2. BUREAU'S INSTELLINGEN EN VERENIGINGEN OP HET GEBIED VAN WINDENERGIE]
A. Curvers and Fr. vanHulle Apr. 1985 24 p In DUTCH
Avail: NTIS HC A02/MF A01

The state of affairs in April 1985 concerning the supply in the Dutch wind energy market is presented. Author (ESA)

N86-19748# Netherlands Energy Research Foundation, Petten.
ECONOMIC AFFAIRS-REFERENCE SCENARIO 1984. SOME CALCULATIONS WITH THE ENERGY MODEL STATIC ESC LINEAR PROGRAMMING ENERGY (SELPE) MODEL [HET EZ-REFERENTIESCENARIO 1984. ENIGE BEREKENINGEN MET HET ENERGIEMODEL SELPE]
P. G. M. Boonekamp and J. J. C. Bruggink Dec. 1984 122 p refs In DUTCH; ENGLISH summary
(ESC-29) Avail: NTIS HC A06/MF A01

The Dutch national energy model SELPE and its application in a reference energy scenario are presented. Using final energy demand projections from the Central Planning Bureau and assumptions about the development of energy technologies and prices, calculations to construct optimal energy balances for the years 1990 and 2000, including several variations of the base case, were done. Special attention was given to developments in the electricity sector, in particular with respect to reliability and other technical aspects. Global results including financial and environmental implications are presented. Author (ESA)

N86-19749# Netherlands Energy Research Foundation, Petten.
NEW ENERGY SOURCES IN JAPAN. PLAN AND EXECUTION OF ENERGY PROGRAMS [NIEUWE ENERGIEBRONNEN IN JAPAN. OPZET EN UITVOERING VAN ENERGIEONDERZOEKPROGRAMMA'S]
T. Kram Mar. 1985 65 p refs Partly in DUTCH and ENGLISH Sponsored by Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer
(ESC-31; B8564257) Avail: NTIS HC A04/MF A01

Japanese energy research programs are surveyed. Concerning the introduction of new energy sources and techniques, a consistent and integrated policy is pursued. Research and development management is set up in close cooperation with trade and industry, while the governement exerts a strong influence upon the market sector. Attention is paid to the Sunshine Project for the stimulation of solar, geothermal, hydrogen-based, coal gasification, and coal liquefaction energy. The new Energy Development Organization, a government institution concerned with undersea coal exploration and the development of geothermal resources, is discussed.
Author (ESA)

N86-19750# Netherlands Energy Research Foundation, Petten.
ENERGY PRODUCTION ESTIMATION AND PARAMETER SENSITIVITY ANALYSIS FOR WIND ENERGY CONVERSION SYSTEMS (WECS)
T. D. Oei, A. Curvers, and H. vandeHee May 1985 36 p refs

(ECN-165; B8565552) Avail: NTIS HC A03/MF A01

The wind energy production computer program WEPP and its applications are described. Loss models for gearbox and generators used in the program are treated. Generator loss models for synchronous and asynchronous generators are given together with four options of turbine mode of control. Wind regime of the turbine site is calculated from a Weibull distribution function, with correction for turbine height and terrain roughness. Examples of production optimization methods, with spider diagrams presenting the sensitivity analysis of such calculations are shown. Author (ESA)

N86-19751# Technische Physische Dienst TNO-TH, Delft (Netherlands). Afdel. Geluid.

NOISE SOURCES IN WIND TURBINES. SOURCE IDENTIFICATION RESEARCH: NOISE SUPPRESSION DESIGN [GELUIDBRONNEN BIJ WINDTURBINES - BRONIDENTIFICATIE-ONDERZOEK GELUIDARM ONTWERPEN]

L. W. A. vanSchie, A. deBruijn, and F. H. vanTol 28 Jun. 1985 70 p refs In DUTCH Sponsored by Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer Prepared for Stichting Projectenbeheerbureau Energie Onderzoek, Utrecht and Bureau Energie Onderzoek Projecten, Petten, Netherlands

(TPD-308.440; TPD-308.452) Avail: NTIS HC A04/MF A01

Aerodynamic and mechanical noise measurements on medium-sized wind turbines were carried out; literature on aerodynamic noise sources at wings was reviewed. The total emission level as a function of the average wind velocity was determined. Aerodynamic wing noise was measured seperately from the nacelle noise using a microphone. A trigger unit consisting of an optical sensor and telelens was developed to measure synchronically the noise signal of the wing in horizontal position. In the nacelle, noise and vibration measurements were done at the entering axis, the gear casing, and the generator. Main sources are the gear casing, the generator, and obstacles on the wings. Noise reducing design recommendations are given. Author (ESA)

N86-19752# Volunteers in Technical Assistance, Inc., Arlington, Va.

UNDERSTANDING SOLAR ENERGY: A GENERAL OVERVIEW

K. Giarman 1985 21 p refs

(PB85-248623; VITA/TP-23:03/85) Avail: NTIS HC A02/MF A01 CSCL 10A

The overview focused on the simplest solar technologies, that is, those least likely to encounter economic and technical barriers during their introduction. Even these are likely to experience cultural impediments that must be understood, confronted, and resolved before total social acceptance is achieved in Third World villages. GRA

N86-19753# Volunteers in Technical Assistance, Inc., Arlington, Va.

UNDERSTANDING ENERGY STORAGE METHODS

C. S. Brooks 1985 23 p

(PB85-248136; VITA/TP-22:03/85) Avail: NTIS HC A02/MF A01 CSCL 10C

An introduction to specific state-of-the-art technologies of interest to people in developing countries is given. The research is intended to be used as a guideline to help people chose technologies that are suitable to their situations. GRA

N86-19754# Volunteers in Technical Assistance, Inc., Arlington, Va.

UNDERSTANDING BATTERIES

L. Merriman 1985 24 p

(PB85-248607; VITA/TP-25:03/85) Avail: NTIS HC A02/MF A01 CSCL 10C

A basic understanding of batteries is given, as well as their development from the early 1800s to the present day. Research and development continues in an effort to solve the inherent weakness of batteries, namely, how to pack more energy into a smaller package. An electric cell or battery is a device that transforms the chemical energy contained within its active materials directly into electrical energy by means of an electrochemical reaction. This type of reaction involves the transfer of electrons from one material to another through a conducting solution. Historically, batteries played an important role in the early days of electrical development both in the United States and in Europe. GRA

N86-19485# Joint Publications Research Service, Arlington, Va.

MOONLIGHT PROJECT PROMOTES ENERGY-SAVING TECHNOLOGY

Akira Ishihara *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 8-15 Transl. into ENGLISH from Denki To Gasu (Tokyo, Japan), Jun. 1985 p 17-21 (For primary document see N86-19484 10-31)

Avail: NTIS HC A06/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N86-19755# National Aeronautical Establishment, Ottawa (Ontario).

A FIELD STUDY OF GROUND DEPOSITION, WIND DRIFT AND BYSTANDER EXPOSURE FROM AGRICULTURAL AIRCRAFT SPRAY EMISSIONS

R. S. Crabbe and M. McCooeye Jul. 1985 42 p

(AD-A160891; NAE-AN-30; NRC-24745) Avail: NTIS HC A03/MF A01 CSCL 02/1

Wind drift, deposition and bystander exposure measurements from agricultural aircraft and ground-rig spray emissions over rural terrain using conventional spray booms and atomizers are presented. A single line was treated. The formulations were aqueous oil emulsions to simulate herbicide applications and aqueous wettable powder emulsions to represent fungicide sprays. Meteorological conditions varied from calm thermally unstable to near-neutral moderately windy (4.9 ms -1 at 4 m above ground). Time-integrated atmospheric droplet concentrations (dosage) were measured at breathing height to 500 m downwind and vertically to drift cloud top at 200 and 500 m downwind. Analysis of field data disclosed initial ground deposit accounting for nearly 100% of the nonvolatiles in the ground-rig emission, but only from 60 to 80% of the aircraft emission depending upon wind speed, in agreement with published data. When transformed into the equivalent operational multi-swath crosswind incremental spray scenario, the data indicated bystander dermal exposures to nonvolatiles at 75 m downwind increasing from 150 microgram for the first swath to 600 microgram after 10 swaths in light winds (2.8 ms -1 at 4 m agl). At 200 m the measured drift cloud mass from the aircraft sprays varied from 1 to 2% of the emission in light winds. In this connection, 90 deg nozzle orientation on the aircraft resulted in greater wind drift than trailing orientation. The wettable-powder drift data revealed that at and beyond 75 m where spray evaporation was essentially complete, the dermal exposure could be less than from herbicide sprays due to the possibility of particle rebound from collecting surfaces. GRA

N86-19756# California Univ., Berkeley. Lawrence Berkeley Lab.

CONTROL OF INDOOR RADON AND RADON PROGENY CONCENTRATIONS

R. G. Sextro May 1985 44 p Presented at the American Society of Heating, Refrigerating and Air-Conditioning Engineers Semiannual Meeting, Honolulu, Hawaii, 23 Jun. 1985

(Contract DE-AC03-76SF-00098)

(DE86-000622; LBL-19726; CONF-850606-16) Avail: NTIS HC A03/MF A01

There are three general categories of techniques for the control of radon and radon progeny concentrations in indoor air - restriction of radon entry, reduction of indoor radon concentrations by ventilation or air cleaning, and removal of airborne radon progeny. The predominant radon entry process in most residences appears to be pressure driven flow of soil gas through cracks or other

openings in the basement, slab, or subfloor. Sealing these openings or ventilation of the subslab or subfloor space are methods of reducing radon entry rates. Indoor radon concentrations may be reduced by increased ventilation. The use of charcoal filters for removal of radon gas in the indoor air by adsorption has also been proposed. Concentrations of radon progeny, which are responsible for most of the health risks associated with radon exposures, can be controlled by use of electrostatic or mechanical filtration. Air circulation can also reduce radon progeny concentrations in certain cases. This paper reviews the application and limitations of each of these control measures and discusses recent experimental results. DOE

N86-19757# Netherlands Energy Research Foundation, Petten.
PLUME WASH-OUT: MODELING, CALCULATION AND VALIDATION
A. J. Janssen and H. M. TenBrink Jul. 1985 60 p refs In DUTCH; ENGLISH summary
(ECN-170; B8569806) Avail: NTIS HC A04/MF A01

For interpretation of experimental results and prediction of wet deposition patterns near power stations, a wash-out model was developed to estimate the wet deposition of several pollutants in plumes. Using a Gaussian dispersion model, plume depletion was determined numerically by following individual rain droplets through the plume and calculating the pollutant, absorption/desorption processes as well as chemical reactions in the droplets, while taking account of mass transport resistances at both sides of the gas/liquid interface. Following experimental evidence, the pollutants: SO2, HC1, HF, B-compounds, and particles (e.g., Al) were included in the model. Good agreement between calculations and measurements of HCl deposition at a coal-fired power plants is found. Plume wash-out of SO2 strongly depends on the concentrations of various species, e.g., H(+) and SO2 background concentrations. Using the results and meteorological data, the annual contribution of a 500 MW coal-fired power plant plume to wet deposition was estimated. Author (ESA)

N86-19758# Delft Hydraulics Lab. (Netherlands). Environmental Hydraulics Branch.
MODELING OF HYPOLYMNETIC WATER QUALITY IN DEEP PITS CREATED BY SAND DREDGING IN THE LAKE IJSSEL AREA
J. A. vanPagee, J. G. C. Smits, and J. A. W. deWit (Ministry of Public Works, Lelystad, Netherlands) Aug. 1984 14 p refs
(Publ-323) Avail: NTIS HC A02/MF A01

Water quality modeling techniques were developed and used to simulate the oxygen budget in the hypolymnetic region of pits with a depth up to 45m created in the Lake IJssel area (Netherlands) as a result of sand dredging. The settling of organic matter originating from phytoplankton growth and the related decomposition can create a high demand for oxygen in the hypolymnetic region of the pit. During the summer period when the pit is thermally stratified this can result in anaerobic conditions. Based on the models, a better understanding of the dominant processes and the influence of pit geometry and water quality of the lake is established. Such information is of special interest for the development of design criteria for new pits or the extension of existing pits in relation to water quality management in the area. Author (ESA)

N86-19759# Energy and Environmental Analysis, Inc., Arlington, Va.
DEVELOPMENT OF THE INDUSTRIAL COMBUSTION EMISSIONS MODEL FOR ACID RAIN ANALYSIS
K. F. Held and J. D. Mobley Jul. 1985 16 p
(Contract EPA-68-02-4202)
(PB85-243822; EPA-600/D-85-152) Avail: NTIS HC A02/MF A01 CSCL 08H

Forecasts of industrial combustion emissions being developed by the U.S. EPA as part of the National Acid Precipitation Assessment Program (NAPAP) are discussed. The Industrial Combustion Emissions (ICE) Model will estimate sulfur dioxide (SO2), nitrogen oxides (NOx), and primary sulfate emissions from industrial fossil-fuel-fired boilers. These forecasts will be generated on a state-level basis. Alternative pollution control scenarios will be evaluated for reducing emissions from both existing and new industrial boilers. The ICE Model also evaluates the selection of fossil fuels for industrial steam generation. Capital and operating/maintenance costs for boilers and pollution control equipment, plus the costs of alternative fuel types, are used in selecting the fuel type for individual industrial boilers. Since emission rates vary significantly between coals, residual fuel oils, and natural gas, the fuel choice decision is a critical factor in estimating aggregate levels of SO2, NOx, and primary sulfates. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N86-19760 New South Wales Univ., Kensington (Australia).
STRATIGRAPHIC INTERPRETATION IN A HIGH-CRANE METAMORPHIC TERRAIN: THE THACKARINGA AREA, BROKEN HILL, NEW SOUTH WALES Abstract Only
I. L. Willis Nov. 1984 2 p
Avail: Issuing Activity

Consistent field classification of metamorphic rocks, structural and lithostratigraphic markers were identified by lithographic mapping in the granulite facies, multiply-deformed rocks of the Thackaringa area. Thirteen stratigraphic units were recognized in the sequence, which forms an important part of the Early Proterozoic Willyama Supergroup of the Broken Hill Block. These units can be referred to as two main groups, the Thackaringa and Broken Hill Groups, in a sequence which appears to be conformable and about 1900 m thick. The basal sequence (Thackaringa Group, Thorndale Composite Gneiss) comprises comparatively immature metasedimentary rocks, with sodic plagioclase + quartz rocks, basic gneiss, leucogneiss and quartzo-feldspathic gneisses, and displays marked facies variations. The overlying Broken Hill Group contains mainly well-bedded metasediments, intercalated with basic gneiss, garnet-rich quartzo-feldspathic gneiss, and minor calc-silicate rock. The uppermost exposed unit, the Sundown Group, consists solely of well-bedded metasediments. Stratiform mineralization of the Broken Hill type occurs mainly in the Broken Hill Group, but a variant is also recognized in the Cues Formation in the underlying Thackaringa Group. Stratiform Fe-Facies mineralized rocks dominate in the Thackaringa Group. The succession in the area is interpreted as a transgressive volcano-sedimentary sequence, probably deposited in a widening and/or deepening intracratonic rift. E.A.K.

N86-19761 New South Wales Univ., Kensington (Australia).
THE EFFECTS OF GEOLOGICAL FACTORS ON FLOODS Abstract Only
Lesmana Polo Apr. 1985 3 p
Avail: Issuing Activity

A physical based basin runoff model, BRUNO, in the form of a computer program, was devised to relate geological factors to the flow properties in the basin, and to analyze the basin response to precipitation. The model takes into account: (1) the basin's major physical structures especially river parameters; (2) the principle of morphohydrology which enables the computation of the channel width and roughness of the upstream drainage network; (3) the equation of continuity and the Manning equation, in order to integrate the stream flowing system and to calculate flow velocity in the channel. E.A.K.

N86-19762 California Inst. of Tech., Pasadena.
STUDIES OF THE CRUST: MANTLE SYSTEM BENEATH SOUTHERN CALIFORNIA Ph.D. Thesis
Eugene Drake Humphreys 1985 196 p
Avail: Univ. Microfilms Order No. DA8519543

A back-projection method of tomographic reconstruction is adapted to invert seismic travel-time data. The problems encountered in inverting these data include ray set inhomogeneity and anisotropy and the three-dimensionality of the space interrogated. Jacobi iteration, deconvolution and variable ray weighting are shown to work well in augmenting the basic back-projection method to produce a well-focused image. Applications of the various focusing algorithms are shown to have a degree of success that depends on the ray geometry used. P-wave teleseismic travel time delays recorded by the southern California array inverted with the tomographic method to obtain variations in the P-wave velocity structure to a depth of 750 km. Two major anomalies are imaged. A curtain-like E-W trending high velocity features is found directly beneath the Transverse Ranges. This feature is about 50 km in thickness, extends in depth to a maximum of about 250 km on its eastern end, and attains a maximum velocity that is about 3% greater than average mantle at the same depth beneath southern California. Dissert. Abstr.

N86-19763 California Univ., Los Angeles.
PROBLEMS IN NONLINEAR CONVECTION IN PLANAR AND SPHERICAL GEOMETRIES Ph.D. Thesis
Edward Warren Bolton 1985 205 p
Avail: Univ. Microfilms Order No. DA8519080

Nonlinear convection was investigated in both planar and spherical geometries. A new family of oscillatory instabilities was found at intermediate Prandtl numbers for plane layer convection with rigid boundary conditions. These instabilities are characterized by various numbers of hot and cold blob pairs circulating in the convective rolls. Solutions for steady, finite amplitude two dimensional convection in a layer heated from below with stress free boundaries are obtained numerically by a Galerkin method. The stability of the steady convection rolls with respect to arbitrary three dimensional infinitesimal disturbances is investigated. The study of nonlinear convection in rotating self gravitating spheres is motivated by the geodynamo problem. A Galerkin method was used to solve the nonlinear governing equations for free slip, isothermal and electrically insulating bounary conditions. The amplitude of convection and the phase velocity of the drifting columns for convection in the nonlinear regime without magnetic field are characterized for Taylor numbers up to 106 for several choices of the dominant wavenumber. Dissert. Abstr.

N86-19764 Washington Univ., Seattle.
MODELING THE INFLUENCE OF HORIZONTAL VARIATIONS IN TERRAIN AND TEMPERATURE ON THE WELL-MIXED BOUNDARY LAYER Ph.D. Thesis
John Walter Glendening 1985 302 p
Avail: Univ. Microfilms Order No. DA8521592

Horizontal variations in boundary layer (BL) properties resulting from horizontal differences in suffface elevation and surface heating are investigated with a mixed-layer dynamic model, which assumes BL variables to be constant with height. Two different parameterization of the upper level pressure gradient required by a one-layer model are derived: one assumes vertically coherent response in the upper layer, the other assumes vertically propagating gravity waves. Their coefficients depend upon the horizontal length scale of the forcing. Modeling horizontal BL variations resulting from flow over a ridge confirms that the vertically coherent parameterization is not appropriate for such flow; the wavelike parameterization produces a more realistic simulation. A two-layer model produces the most realistic simulation. Analysis of the upslope flow produced by daytime heating of an inclined surface yields its dependence upon surface heat flux, slope angle, BL depth, and upper layer lapse rate. Dissert. Abstr.

N86-19765 California Inst. of Tech., Pasadena.
METHODS OF MULTIPARAMETER INVERSION OF SEISMIC DATA USING THE ACOUSTIC AND ELASTIC BORN APPROXIMATIONS Ph.D. Thesis
Ronan LeBras 1985 152 p
Avail: Univ. Microfilms Order No. DA8519550

This thesis presents two different forms of the Born approximations for acoustic and elastic wavefields and discusses their application to the inversion of seismic data. The Born approximation is valid for small amplitude heterogeneities superimposed over a slowly varying background. The first method is related to frequency-wavenumber migration methods. It is shown to properly recover two independent acoustic parameters within the bandpass of the source time function of the experiment for contrasts of about 5 percent from data generated using an exact theory for flat interfaces. The independent determination of two parameters is shown to depend on the angle coverage of the medium. The second method explored is mathematically similar to iterative tomographic methods recently introduced in the geophysical literature. Its basis is an integral relation between the scattered wavefield and the medium parameters obtained after applying a far-field approximation to the first-order Born approximation. Dissert. Abstr.

N86-19766 Minnesota Univ., Minneapolis.
SEISMIC WAVE ATTENUATION IN UNCONSOLIDATED SEDIMENTS Ph.D. Thesis
Mohammed Badri 1985 537 p
Avail: Univ. Microfilms Order No. DA8519265

Several time and frequency domain processing methods were used to compute the in situ compressional wave velocity and specific dissipation function Q in water saturated unconsolidated sediments. The sediment is characterized by soft, water saturated, unconsolidated, silty sand clays with mean grain size diameter of 7.48 micrometers. Source explosive sizes ranging from 1 to 64 mg of silver azide were used to generate seismic waveforms. The computed compressional wave velocity value is observed to be in the range from 1507 to 1776 m/sec. An average Q value of 26 is obtained using the spectral amplitude ratio analysis over the frequency range 450 to 725 Hz for the five different explosive source sizes. Peak amplitude ratio measurements produced an average Q value of 123. The wide variation of the computed Q values indicates that the rise time and pulse broadening methods are probably source-dependent. This makes the spectral amplitude ratio method preferable over these two methods since it is a source independent method. The dominant attenuation mechanism is unconsolidated sediments appears to be internal friction over the frequency range 450 to 725 Hz. Dissert. Abstr.

N86-19767 Cornell Univ., Ithaca, N.Y.
RADAR INTERFEROMETER OBSERVATIONS AND THEORY OF PLASMA IRREGULARITIES IN THE AURORAL IONOSPHERE Ph.D. Thesis
Jason Fred Providakes 1985 374 p
Avail: Univ. Microfilms Order No. DA8517012

The radar interferometer technique first used at the equator in Peru is also a very powerful means for studying auroral plasma instabilities. The horizontal interferometer successfully measured the transverse vector electron drift velocities and the electric fields associated with radio aurora visual discrete auroral arcs. The interferometer observations generally show that separate echoeing regions within the scattering volume are responsible for composite spectra (e.g., type 1 and type 2 spectral features occurring simultaneously within the same spectrum). Kilometer scale (lambda approx. 50 km + or - 20 km) wave-like structures are often observed along the radar line-of-sight during intense magnetic storms (K sub p $>$ 6). A new spectral type, referred to here as type 4 has been identified and is shown to be probably by a type 1 spectrum with an unusually larger Doppler shift from a region where the local ion acoustic speed is much larger than normal, due to enhanced electron temperature caused by anomalous plasma wave heating in the auroral electrojet. Dissert. Abstr.

N86-19768 Saint Louis Univ., Mo.
AN INVESTIGATION OF THE VERTICAL DISTRIBUTION OF TRACE CONSTITUENTS IN THE TROPOSPHERE WITH A ONE-DIMENSIONAL PHOTOCHEMICAL MODEL AND SIMPLE MODELS OF THE PLANETARY BOUNDARY LAYER Ph.D. Thesis
Thomas Albert Carney 1984 142 p

Avail: Univ. Microfilms Order No. DA8520099

This dissertation describes two separate experiments to improve the vertical transport parameterization of a one-dimensional photochemical model of the troposphere by incorporating models of boundary layer dynamics. The first experiment simulated the mid-latitude continental troposphere in summer and contrasted the conventional constant eddy-flux parameterization of tropospheric mixing to a new time- and height-dependent mixing scheme developed from proven models of boundary layer structure and dynamics. The resulting contrast in model-derived profiles suggest that proper parameterization of the diurnal cycle of mixing characteristic of continental areas is important to understanding global trace gas budgets. The second experiment simulates a remote marine tropical environment. The vertical transport parameterization considered the transport properties of shallow dispersed cumulus characteristic of the divergent trade-wind flow regions. Dissert. Abstr.

N86-19769*# Lunar and Planetary Inst., Houston, Tex.
ARCHEAN FORELAND BASIN TECTONICS IN THE WITWATERSRAND, SOUTH AFRICA
Kevin Burke, William S. F. Kidd (State Univ. of New York, Albany), and T. M. Kusky (State Univ. of New York, Albany) 1986 62 p refs
(Grants NAG5-333; NAGw-489)
(NASA-CR-176561; NAS 1.26:176561) Avail: NTIS HC A04/MF A01 CSCL 08G

The Witwatersrand Basin of South Africa is the best-known of Archean sedimentary basins and contains some of the largest gold reserves in the world. Sediments in the basin include a lower flysch-type sequence and an upper molassic facies, both of which contain abundant silicic volcanic detritus. The strata are thicker and more proximal on the northwestern side of the basin which is, at least locally, bound by thrust faults. These features indicate that the Witwatersrand strata may have been deposited in a foreland basin and a regional geologic synthesis suggests that this basin developed initially on the cratonward side of an Andean-type arc. Remarkably similar Phanerozoic basins may be found in the southern Andes above zones of shallow subduction. It is suggested that the continental collision between the Kaapvaal and Zimbabwe Cratons at about 2.7 Ga caused further subsidence and deposition in the Witwatersrand Basin. Regional uplift during this later phase of development placed the basin on the cratonward edge of a collision-related plateau, now represented by the Limpopo Province. Similarities are seen between this phase of Witwatersrand Basin evolution and that of active basins north of the Tibetan Plateau. The geologic evidence does not agree with earlier suggestions that the Witwatersrand strata were deposited in a rift or half-graben. E.A.K.

N86-19770# Institute of Oceanographic Sciences, Birkenhead (England).
HIGH PRECISION TIDAL GRAVITY Final Report, 1 Mar. 1984 - 28 Feb. 1985
T. F. Baker, R. J. Edge, and G. Jeffries 20 Jun. 1985 14 p
(Grant AF-AFOSR-0071-84)
(AD-A160676; AFGL-TR-85-0203) Avail: NTIS HC A02/MF A01 CSCL 08/5

This report discusses recent progress on the programme of high precision tidal gravity. The programme is now primarily concerned with the field measurement of tidal gravity and a description of present experiments and preliminary results is given. The preliminary results show that a measurement accuracy in amplitude for the principal tidal harmonics O sub 1 = and M2 of + or - 0.2 % is achievable and that phases may be determined to + or - 0.1 deg. This is approaching an order of magnitude improvement over existing measurements. GRA

N86-19771# International Centre for Earth Tides, Brussels (Belgium).
TRANS WORLD TIDAL GRAVITY PROFILE Final Report, 1 Jan. - 31 Dec. 1984
P. Melchior 31 Dec. 1984 48 p
(Grant AF-AFOSR-0097-82)
(AD-A160723; AFGL-TR-85-0202) Avail: NTIS HC A03/MF A01 CSCL 08/5

The study analyzes 115 stations in the World Data Bank for Tidal Gravity. Under this study, 76 of these stations have been established in the equatorial and tropical regions as well as the Southern Hemisphere. This broad coverage has allowed, for the first time, for experimental determination of the Love numbers foreseen by Love (1911) and confirmed by Wahr (1981). This effect results from the flattening of the Earth and from the Coriolis force. GRA

N86-19772# Texas Univ., Austin. Applied Research Lab.
MEASUREMENT OF COMPRESSIONAL WAVE PARAMETERS IN SATURATED SANDS Final Report, 1 Sep. 1983 - 31 Aug. 1984
R. D. Costley, Jr., A. M. Bedford, and Paul J. Vidmar 8 May 1985 51 p
(Contract N00014-83-K-0696)
(AD-A161067; ARL-TR-85-13) Avail: NTIS HC A04/MF A01 CSCL 08/13

The focus of this research was to improve the accuracy of velocity and attenuation measurements so that a definitive test of the Biot-Stoll theory could be made. The major accomplishments during this period were refining the design of transducers, improving the procedures for making accurate laboratory measurements of the velocity and attenuation of shear and compressional waves in saturated sands, and locating the sources of experimental error. Preliminary measurements of compressional wave parameters were also made as the first step in testing the Biot-Stoll theory. GRA

N86-19773# Geological Survey, Denver, Colo.
BATHOLITHIC ROCKS OF SOUTHERN CALIFORNIA: A MODEL FOR THE PETROCHEMICAL NATURE OF THEIR SOURCE MATERIALS
A. K. Baird and A. T. Miesch 1984 44 p refs
(TI85-902207; USGS-PP-1284) Avail: NTIS HC A03/MF A01

Major-element analyses of 497 composite samples of batholithic rocks (quartz diorites, granodiorites, and quartz monzonites) from the northern Peninsular Ranges and Transverse Ranges Provinces, southern California, form basis for a mixing model that accounts for most of the compositional variation in the rocks. The compositional structure in the batholithic rocks as a group was found to be similar to that in the Sierra Nevada batholith, and indicates that four end members are sufficient to account for 85 to 97 percent of the variability in each of the eight major oxides. According to the model, the batholithic rocks formed from the mixing of basaltic and quartzofeldspathic end-member magmas, and the removal of variable proportions of plagioclase and mafic minerals, principally hornblende. Gabbroic rocks, common only in the western part of the region, could have formed from nearly uncontaminated magmas of the basaltic end member. Variations in the mixtures of basaltic and quartzofeldspathic magmas are presumed to reflect variations in their source materials at depth. According to the model, the compositions of the source materials do not vary smoothly over the region, but display a discontinuity along a line approximately coincident with the present San Jacinto fault zone. The discontinuity is roughly coincident with previously noted petrologic and isotopic discontinuites in the northern Peninsular Ranges and is interpreted as the western limit of significant contribution of continental materials to the batholithic rocks. The model gives no evidence of a discontinuity in the vicinity of the San Andreas fault zone. Author

N86-19774# Geological Survey, Albany, N.Y.
STRUCTURAL AND TECTONIC STUDIES IN NEW YORK STATE Final Report, Jul. 1981 - Jun. 1982
Y. W. Isachsen Apr. 1985 84 p
(Contract NRC-04-74-328)
(TI85-901403; NUREG/CR-3178) Avail: NTIS HC A05/MF A01

Research was conducted during the period July 1976 to June 1982, as part of an earlier and continuing project to analyze the distribution patterns, geometry and geological history of brittle

deformation in New York State. A general background of previous work and a summary and analysis of new structural and tectonic studies undertaken towards providing a more comprehensive knowledge of regional brittle deformation in the northeast are given. Among other applications, the new data and insights obtained will provide a geological background for specialists in the fields of seismotectonic analysis and seismic risk analysis, and may contribute towards an eventual understanding of the factors that determine which geological surfaces are currently seismogenic, or likely to become seismogenic in the future. Subjects treated include the distribution, trends, exposure characteristics, aeromagnetic signatures, and detailed geometries of fracture systems, as well as tentative inferences concerning relative ages and causes of reactivation. Stress indicates are discussed, and a beginning is made at working out regional paleostress directions using the attitudes of dated mafic dikes. R.J.F.

N86-20197# Joint Publications Research Service, Arlington, Va.
DIRECTIVITY OF PROTON FLUX WITH E SUB p > 12 KeV IN LOW-LATITUDE TRANSITION REGION Abstract Only
K. Kudela, V. N. Lutsenko, N. F. Pisarenko, Y. Royko, and S. Fisher *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 92 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 317-319 Original language document was announced in IAA as A85-35248 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20203# Joint Publications Research Service, Arlington, Va.
STABILITY OF DIAMAGNETIC PLASMOID IN MAGNETOSPHERE Abstract Only
S. V. Leontyev, V. B. Lyatskiy, and A. A. Khrushchinskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 96-97 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 100-105 Original language document was announced in IAA as A85-28491 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20204# Joint Publications Research Service, Arlington, Va.
ENERGY DISTRIBUTIONS OF PROTONS WITH 0.05 < OR = E < OR = 50 MeV IN EARTH'S RADIATION Abstract Only
M. I. Panasyuk and E. N. Sosnovets *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 97-98 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 106-112 Original language document was announced in IAA as A85-28492 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20207# Joint Publications Research Service, Arlington, Va.
O+-He AND H+-He MEAN COLLISION FREQUENCIES FOR IONOSPHERIC RESEARCH Abstract Only
A. V. Pavlov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 99-100 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 143-147 Original language document was announced in IAA as A85-28496 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20213# Joint Publications Research Service, Arlington, Va.
MODELING CHARGED PARTICLE FLUXES ALONG SPACE VEHICLE FLIGHT TRAJECTORIES IN EARTH'S RADIATION BELTS Abstract Only
O. I. Savun and B. Yu. Yushkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 104 Transl. into ENGLISH from Vestnik Moskovskogo Universiteta, Seriya 3: Fizika, Astronomiya (Moscow, USSR), v. 26, no. 1, Jan. - Feb. 1985 p 3-8 Original language document was announced in IAA as A85-36596 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20251# Joint Publications Research Service, Arlington, Va.
METHODS FOR STUDYING RECENT TECTONICS USING MATERIALS FROM REMOTE AND SURFACE DATA Abstract Only
A. A. Freydlin, Ye. G. Farrakhov, and L. F. Volchegurskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 147-148 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 32-38 Original language document was announced in IAA as A85-29904 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N86-19775 Illinois Univ., Urbana-Champaign.
A CUMULUS PARAMETERIZATION STUDY WITH SPECIAL ATTENTION TO THE ARAKAWA-SCHUBERT SCHEME Ph.D. Thesis
Chih-Yue Jim Kao 1985 222 p
Avail: Univ. Microfilms Order No. DA8521797

Arakawa and Schubert (1974) developed a cumulus parameterization scheme in a framework that conceptually divides the mutual interaction of the cumulus convection and large-scale disturbance into the categories of large-scale budget requirements and the quasi-equilibrium assumption of cloud work function. The A-S scheme was applied through a semi-prognostic approach to two different data sets: one is for an intense tropical cloud band event; the other is for tropical composite easterly wave disturbances. It is found that the Arakawa-Schubert scheme underestimates both condensation and evaporation rates substantially when compared with the cumulus ensemble model results. In order to examine how the Arakawa-Schubert scheme works in a fully prognostic problem, a simulation of the evolution and structure of the tropical cloud band, mentioned above, under the influence of an imposed large-scale low-level forcing has been made, using a two-dimensional hydrostatic model with the inclusion of the Arakawa-Schubert scheme. Dissert. Abstr.

N86-19776 California Univ., Los Angeles.
NUMERICAL SIMULATION OF TROPICAL CUMULUS CLOUDS AND THEIR INTERACTION WITH THE SUBCLOUD LAYER Ph.D. Thesis
Steven Keith Krueger 1985 233 p
Avail: Univ. Microfilms Order No. DA8519119

A two-dimensional numerical model suitable for simulation in ensemble of cumulus clouds has been developed. The model is similar to one developed by Soong and Ogura (1980), but has greater emphasis on turbulent processes. In the model, cloud-scale dynamics are coupled with a third-moment turbulence closure model. A turbulence-scale condensation scheme is used to parameterize the cloud water mixing ratio. The computation domain is 30 km long and 15 km high. The horizontal grid size is 1 km, while the vertical grid size ranges from 100 m in the lowest layer to about 1 km in the uppermost. The cyclic boundary conditions was used at the lateral boundaries. Two simulations were performed: one with upward large-scale vertical velocity (the disturbed case), and one without any (the undisturbed case), but otherwise identical. Deep cumulus clouds formed in the disturbed case, but only shallow clouds formed in the undisturbed case.
Dissert. Abstr.

N86-19777 California Univ., Los Angeles.
A CLOUD TUNNEL STUDY ON THE RIMING OF SNOWFLAKES AND A THEORETICAL INVESTIGATION ON THE CAPTURE EFFICIENCY OF ICE CRYSTALS BY LARGE CLOUD DROPS Ph.D. Thesis
Jeffrey Kevin Lew 1985 346 p
Avail: Univ. Microfilms Order No. DA8519122

A theoretical model has been formulated to study the trajectories and collision efficiencies of small columnar and plate-like ice crystals as they pass relatively large supercooled cloud drops.

The model is similar to the one used by Grover (1980) and uses hydrodynamic and gravity effects to determine the trajectories. Cloud drops of radii 416 to 591 micrometer corresponding to Reynolds numbers 200 to 400 at 900 mb and -6 C were used in the columnar crystal computations and drops of radii 530 to 760 micrometer corresponding to the same Reynolds numbers at 400 mb and -12 C were used in the plate-like crystal computations. In each case, the ice crystals were assumed to take three typical orientations as they passed the drop. It is found that for typical sizes and length-to-width ratios of column crystals in the atmosphere, and for plate-like crystals over 40 micrometer diameter, the collision efficiency ranges from 0.8 to 1.0. For these particular ice crystals, the orientation does not appear to be as important as the crystal mass in determining the collision efficiency. Dissert. Abstr.

N86-19778 Purdue Univ., West Lafayette, Ind.
A SIMULATION OF THE CANOPY MICROENVIRONMENT USING HIGHER ORDER CLOSURE PRINCIPLES Ph.D. Thesis
Tilden Payne Meyers 1985 170 p
Avail: Univ. Microfilms Order No. DA8520049

The deficiencies of gradient diffusion theory to model turbulent transport in the plant canopy are becoming widely recognized although both modeling and experimental efforts still rely heavily upon these concepts. Recently, second order closure models have been used to successfully simulate the profiles of the mean wind speed, tangential stress and turbulent kinetic energy within a canopy. Problems with parameterizing the third order transport term for the tangential stress have been noted. In addition, second order closure models have only been applied to a few types of canopy structures and further testing is needed. A third order closure model has been developed to simulate airflow in a vegetative canopy for neutral conditions. The model contains simplified equations for the third order terms, bypassing the need to parameterize them as is done in second order closure. The model has been applied to a maize, soybean, wheat, orange, bean and sitka spruce canopy. The simulated mean wind profiles compared favorably with measurements. Dissert. Abstr.

N86-19779 Miami Univ., Coral Gables, Fla.
EFFECT OF FOSSIL FUELS AND INTRODUCTION OF HYDROGEN ON EARTH'S TEMPERATURE Ph.D. Thesis
Ilker Gurkan 1985 154 p
Avail: Univ. Microfilms Order No. DA8519211

The GREENHOUSE THEORY says that increase in CO2 will warm the Earth. That means certain greenhouse gases (particularly CO2) in the atmosphere allow the Sun's ultraviolet and visible radiation to penetrate and warm the Earth, but then absorb the infrared energy the Earth radiates back into the atmosphere. By blocking the escape of this radiation, these gases effectively form a thermal blanket around the Earth. To rebalance the incoming and outgoing radiation, the Earth's temperature must increase. A computer model has been developed to calculate the effect of atmospheric CO2 concentration and introduction of hydrogen on the Earth's mean temperature. The results were checked with the historical data. After the validity of the model had been established, the computer program was run for the years 1985 through 2100 to estimate the atmospheric CO2 concentrations and the Earth's mean temperature. Atmospheric CO2 concentration increases with the increase of fossil fuel consumption. Dissert. Abstr.

N86-19780*# Cologne Univ. (West Germany). Inst. for Geophysics and Meteorology.
MAPPING THE DOWNWELLING ATMOSPHERIC RADIATION AT THE EARTH'S SURFACE: A RESEARCH STRATEGY
E. Raschke Feb. 1986 23 p refs
(NASA-CR-178054; L-85614B; NAS 1.26:178054) Avail: NTIS HC A02/MF A01 CSCL 04B

A strategy is presented along with background material for determining downward atmospheric radiation at the Earth's surface on a regional scale but over the entire globe, using available information on the temperature and humidity of the air near the ground and at cloud base altitudes. Most of these parameters can be inferred from satellite radiance measurements. Careful validation of the derived radiances will be required using ground-based direct measurements of radiances, to avoid systematic biases of these derived field quantities. Author

N86-19781*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION OF THE GODDARD LABORATORY FOR ATMOSPHERES FOURTH-ORDER TWO-LAYER SHALLOW WATER MODEL
Lawrence L. Takacs, comp. Feb. 1986 83 p refs
(NASA-TM-86227; Rept-85B0505; NAS 1.15:86227) Avail: NTIS HC A05/MF A01 CSCL 04B

The theory and numerical treatment used in the 2-level GLA fourth-order shallow water model are described. This model was designed to emulate the horizontal finite differences used by the GLA Fourth-Order General Circulation Model (Kalnay et al., 1983) in addition to its grid structure, form of high-latitude and global filtering, and time-integration schemes. A user's guide is also provided instructing the user on how to create initial conditions, execute the model, and post-process the data history. Author

N86-19782# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: RAMSTEIN AB (WEST GERMANY) Data Summary Report, Jan. 1974 - Dec. 1983
May 1985 413 p
(AD-A159634; USAFETAC/DS-85/015) Avail: NTIS HC A18/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Ramstein AB, West Germany, consists of: PART A, Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19783# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A-F: VANDENBERG AFB, CALIFORNIA Data Summary Report, Jan. 1975 - Dec. 1984
Jun. 1985 258 p
(AD-A159635; USAFETAC/DS-85/020) Avail: NTIS HC A12/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for Vandbenberg AFB, California, is discussed. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: PART A, Weather Conditions and Atmospheric Phenomena; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; and PART F, Pressure Summaries. Note that PART B, Precipitation, is omitted. SEE USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-19784# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: WRIGHT-PATTERSON AFB, OHIO Data Summary Report, Jun. - May 1985
Sep. 1985 307 p
(AD-A159636; USAFETAC/DS-85/050) Avail: NTIS HC A14/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observations climatology for Wright-Patterson AFB, Ohio, consists of: PART

A, Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19785# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A-F: MCENTIRE ANGB, SOUTH CAROLINA-COLUMBIA Data Summary Report, Jun. 1974 - May 1984

Dec. 1984 366 p

(AD-A159637; USAFETAC/DS-84/041) Avail: NTIS HC A16/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for McEntire ANGB, South Carolina, is discussed. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: PART A, Weather Conditions and Atmospheric Phenomena; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; and PART F, Pressure Summaries. Note that PART B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-19786# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: REESE AFB, TEXAS Data Summary Report, Mar. 1975 - Feb. 1985

Jul. 1985 483 p

(AD-A159638; USAFETAC/DS-85/028) Avail: NTIS HC A21/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Reese AFB, Texas, consists of: PART A, Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19787# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A-F: HAO ISLAND, SOUTH PACIFIC Data Summary Report, Jun. - May 1985

Sep. 1985 261 p

(AD-A159639; USAFETAC/DS-85/045) Avail: NTIS HC A12/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for Hao Island, South Pacific, is discussed. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: PART A, Weather Conditions and Atmospheric Phenomena; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; and PART F, Pressure Summaries. Note that PART B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. (Author). GRA

N86-19788# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: WATERTOWN, NEW YORK Data Summary Report, Jan. 1974 - Dec. 1983

Oct. 1984 471 p

(AD-A159640; USAFETAC/DS-84/035) Avail: NTIS HC A20/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Watertown, New York, consists of: PART A, Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19789# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A-F: FORT DEVENS AAF, MASSACHUSETTS Data Summary Report, Aug. 1974 - Jul. 1984

Jul. 1985 292 p

(AD-A159641; USAFETAC/DS-85/027) Avail: NTIS HC A13/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for Fort Devens Army Air Field, Massachusetts, is discussed. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: PART A, Weather Conditions and Atmospheric Phenomena; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; and PART F, Pressure Summaries. Note that PART B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-19790# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: POPE AFB, NORTH CAROLINA Data Summary Report, Dec. 1973 - Nov. 1983

Mar. 1985 469 p

(AD-A159642; USAFETAC/DS-85/008) Avail: NTIS HC A20/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Pope AFB, North Carolina, consists of: PART A, Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; PART D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19791# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

ATSUGI NAS, JAPAN. LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PART A, C-F Data Summary Report, Jan. 1974 - Dec. 1983

Feb. 1985 401 p

(AD-A159684; AD-E801193; USAFETAC/DS-85/006) Avail: NTIS HC A18/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for Atsugi NAS, Japan, is discussed. This summary is similiar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week.

The summary is in five parts: PART A, Weather Conditions and Atmospheric Phenomena; PART C, Surface Winds; Part D, Ceiling and Visibility; PART E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that PART B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-19792# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

EDWARDS AFB, CALIFORNIA. LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). PARTS A, C-F Data Summary Report, Sep. 1974 - Aug. 1984

Dec. 1984 340 p

(AD-A159688; USAFETAC/DS-84/039) Avail: NTIS HC A15/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for Edwards AFB, California, is discussed. This summary is similiar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: PART A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B, Precipitation, is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. Author (GRA)

N86-19793# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: SUWON AB, SOUTH KOREA Data Summary Report, Jan. 1974 - Dec. 1983

Nov. 1984 315 p

(AD-A159689; USAFETAC/DS-84/040) Avail: NTIS HC A14/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Suwon AB, South Korea, consists of: PART A: Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; Part D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19794# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: GRIFFISS AFB, NEW YORK Data Summary Report, Jul. 1974 - Jun. 1984

Jan. 1985 478 p

(AD-A159690; USAFETAC/DS-85/001) Avail: NTIS HC A21/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Griffiss AFB, New York, consists of: PART A: Weather Conditions and Atmospheric Phenomena; PART B, Precipitation; PART C, Surface Winds; Part D, Ceiling and Visibility; PART E, Psychrometric Summaries; PART F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. Author (GRA)

N86-19795# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: FORT SILL, OKLAHOMA Data Summary Report, Apr. 1975 - Mar. 1985

Aug. 1985 491 p

(AD-A159699; USAFETAC/DS-85/043) Avail: NTIS HC A21/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Fort Sill, Oklahoma, consists of the following parts: (1) Weather Conditions and Atmospheric Phenomena; (2) Precipitation; (3) Surface Winds; (4) Ceiling and Visibility; (5) Psychrometric Summaries; and (6) Pressure Summaries. Data in this report are presented in tabular form, in most cases in percentage frequency of occurence or cumulative percentage frequency of occuring tables. Author (GRA)

N86-19796# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: FAIRCHILD AFB, WASHINGTON Data Summary Report, Jun. 1975 - May 1985

Sep. 1985 305 p

(AD-A159700; USAFETAC/DS-85/051) Avail: NTIS HC A14/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Fairchild AFB, Washington, consists of the following parts: (1) Weather Conditions and Atmospheric Phenomena; (2) Precipitation; (3) Surface Winds; (4) Ceiling and Visibility; (5) Psychrometric Summaries; and (6) Pressure Summaries. Data in this report are presented in tabular form, in most cases in percentage frequency of occurence or cumulative percentage frequency of occuring tables. Author (GRA)

N86-19797# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: MACKALL AAF, NORTH CAROLINA Data Summary Report, Dec. 1973 - Nov. 1983

Mar. 1985 472 p

(AD-A159701; USAFETAC/DS-85/010) Avail: NTIS HC A20/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Mackal AAF (Pope AFB), North Carolina, consists of the following parts: (1) Weather Conditions and Atmospheric Phenomena; (2) Precipitation; (3) Surface Winds; (4) Ceiling and Visibility; (5) Psychrometric Summaries; and (6) Pressure Summaries. Data in this report are presented in tabular form, in most cases in percentage frequency of occurence or cumulative percentage frequency of occuring tables. Author (GRA)

N86-19798# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: JOHNSTON ISLAND Data Summary Report, Jan. 1974 - Dec. 1983

Jan. 1985 413 p

(AD-A159702; USAFETAC/DS-85/002) Avail: NTIS HC A18/MF A01 CSCL 04/2

A six-part statistical data summary of surface weather observation climatology for Johnston Island, consists of the following parts: (1) Weather Conditions and Atmospheric Phenomena; (2) Precipitation; (3) Surface Winds; (4) Ceiling and Visibility; (5) Psychrometric Summaries; and (6) Pressure Summaries. Data is presented in tabular form, in most cases in percentage frequency of occurence or cumulative percentage frequency of occurring tables. Author (GRA)

N86-19799# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

CLIMATOLOGICAL ATLAS FOR IRAQ Data Summary Report, 1923 - 1956

Apr. 1985 222 p

(AD-A159703; USAFETAC/DS-85/011) Avail: NTIS HC A10/MF A01 CSCL 04/2

A climatological atlas for Iraq that provides, in graphic and chart form, a relatively fast and simple look at the weather and climate of the Republic of Iraq. Periods of record vary; although

some data begins with 1923, most record periods begin with the mid-1930's. All data ends with 1956. Elements chronicled are precipitation, temperature, humidity, pressure, cloudiness, dust, fog, thunderstorm, and wind. Author (GRA)

N86-19800# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A CASE STUDY OF A MID-ATLANTIC COASTAL FRONT M.S. Thesis
J. T. Kroll 1985 100 p
(AD-A160828; AFIT/CI/NR-85-135T) Avail: NTIS HC A05/MF A01 CSCL 04/1

A unique case of mid-Atlantic coastal frontogenesis on December 21 and 22, 1983 is examined to determine the evolution of the three dimensional structure of this mesoscale phenomena. Analysis of synoptic and mesoscale surface maps suggest a coastal front which moves steadily inland. However, review of temperature and wind profiles at individual stations reveals that frontogenesis actually occurs over the land in North Carolina and southern Virginia. Lagrangian and Eulerian frontogenesis process is found to be largely a result of the ageostropic flow within the cold wedge which results in weak cold air advection over the land. This northerly flow combines with a strong southerly flow over the Atlantic to increase the temperature gradient near the coastline. Analysis of kinematic variables indicates regions of relatively strong convergence and cyclonic vorticity in the region of the coastal front. Precipitation analyses identify the cold air side of the coastal front as favorable for enhanced precipitation. Relationships between precipitation bands and convective instability are also discussed. GRA

N86-19801# Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF SIX VERTICAL DISCRETIZATION SCHEMES M.S. Thesis
Mary S. Jordan Sep. 1985 175 p
(AD-A161049) Avail: NTIS HC A08/MF A01 CSCL 12/1

Six vertical discretization schemes are compared for a linear, baroclinic, vorticity-divergence equation model in this thesis. Variables for the atmospheric prediction model are defined for two staggered and one unstaggered grids. A finite difference and a Galerkin finite element approximation are formulated for each of the three grids. The models are tested in three experiments. The largest difference between the grids occurs in the mid-atmosphere diabatic heat source experiment and the unstaggered grid provides the best results. For the staggered grids, the results of the finite element models are not more accurate than the corresponding finite difference results. Oscillations occur in the temperature profiles near the surface for both staggered finite element models. Results of Rossby wave, Mountain topography, and diabatic heating experiments are presented. GRA

N86-19802# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE ATMOSPHERIC BOUNDARY LAYER OVER THE ARCTIC OCEAN USING SODAR (SOUND DETECTION AND RANGING) M.S. Thesis
Etienne deRouge Sep. 1985 80 p
(AD-A161057) Avail: NTIS HC A05/MF A01 CSCL 04/1

An attempt to describe the atmospheric boundary layer during the (Marginal Ice Zone Experiment) MIZEX 84 from 11 July to 17 July was made using a sodar system. The computation of the temperature structure parameter CT2 in the surface layer using in situ measurements allowed the calibration of the system. A program was developed to obtain the inversion layer height Zi, where the signal reaches a maximum. The thickness of the inversion layer was also computed and was used with the calibration law to compute CT(2) at the inversion layer. Refractive trapping conditions were evident on 15 July although the generally small value of the heat flux did not indicate a strongly unstable boundary layer. Comparison with two radiosonde profiles shows good agreement in one case. It is the purpose of this thesis to calibrate the sodar system deployed by the research vessel POLAR QUEEN during MIZEX 84 to obtain the refractive-index structure parameter. The time-height structure of the boundary layer will also be investigated. Efforts will also be made to compute the height of the inversion layer and to estimate its thickness, the jump of potential temperature, and the refractive-index gradient. GRA

N86-19803# Naval Postgraduate School, Monterey, Calif.
NUMERICAL SIMULATION OF COLD SURGES M.S. Thesis
Nancy E. Harris Sep. 1985 81 p
(AD-A161133) Avail: NTIS HC A05/MF A01 CSCL 04/2

A global, six-level primitive equation model was numerically integrated to examine the interaction of a planetary wave with a growing mid-latitude baroclinic wave. The purpose of this study was to determine the contribution of the baroclinic wave to the initiation of a monsoon surge. Three experiments were run. Experiment 1 depicted the effect of the planetary wave on the southward migration of cold air. The cyclogenesis of a mid-latitude baroclinic wave was shown in Experiment 2. Experiment 3 combined the growing baroclinic wave with the stable planetary wave in an attempt to simulate a cold surge. Characteristics of a monsoon surge were present in the numerical simulation but not to the extent or detail of observed surges. The results indicated the important role of planetary wave advections in the formation of cold surges. GRA

N86-19804# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
EFFECTS OF MOUNTAIN RANGES ON MESOSCALE SYSTEMS DEVELOPMENT Final Report, 15 Apr. 1982 - 31 Jul. 1985
Elmar R. Reiter, John D. Sheaffer, Marjorie A. Klitch, and Ray L. McAnelly Sep. 1985 191 p
(Grant AF-AFOSR-0162-82)
(AD-A161136; AFOSR-85-0924TR) Avail: NTIS HC A09/MF A01 CSCL 04/2

Synoptic studies addressed themselves to a moisture bridge over Central America which often is tied to severe weather in the Rocky Mountain area. Heavy flooding events over eastern China have been tied to preferred positions of blocking highs and to vortices developing over the Plateau of Tibet. Mesoscale convective systems over, and to the east of, the U.S. Rocky Mountains have been investigated by individual case studies as well as by satellite composite imagery. There appears to be a well-defined sequence of events, whereby first the average precipitation rate maximizes, then the volumetric rain rate, and finally the rain area. Appendices: a satellite climatology of intense convective storms from manually digitized hourly cloud cover fields; meso-beta-scale characteristics of the meso-alpha-scale convective complex; evolution of precipitation and upper air characteristics during the life-cycle of a composite mesoscale convective complex; the precipitation life cycle of mesoscale convective complexes. GRA

N86-19805# Meteorological Office, Bracknell (England). Satellite Meteorology Branch.
ERS-1 SURFACE WIND AMBIGUITY REMOVAL BY MEANS OF OBJECTIVE PROCESSING AND SUBJECTIVE HUMAN INTERVENTION Final Report
D. Offiler Aug. 1985 55 p refs Original contains color illustrations
(Contract ESA-6154/85-NL-BI)
(ESA-CR(P)-2110) Avail: NTIS HC A04/MF A01

The directional ambiguity problem in ERS-1 satellite wind scatterometer measurements is studied. The two algorithms used for objective evaluation use no data other than that produced by the satellite in one case and incorporate external data in the form of meteorological forecast fields in the other. A subjective trackerball interactive removal (STIR) algorithm is also investigated. The three algorithms are all capable of being applied to the raw ambiguous scatterometer product. Each technique has its strengths and weaknesses, which are discussed. Only if near perfect suppression is required does the subjective STIR technique need to be involved. An optimum sequence of techniques can increase the baseline skill from around 70% to > 99%. Author (ESA)

N86-19806# Royal Netherlands Meteorological Inst., De Bilt. Afdel. Dynamische Meteorologie.

FORECAST UPDATING: THEORY AND APPLICATION TO A SIMPLE MODEL
P. Lynch 1985 52 p refs
(KNMI-WR-85-4; B8570100; ISSN-0169-1651) Avail: NTIS HC A04/MF A01

The use of updating to see where an early weather forecast is going wrong, and to amend later forecasts is explained. If a forecast is analyzed into its normal modes, the error dynamics of each component are relatively simple. By making reasonable assumptions about the behavior of nonlinearities, it is possible to estimate the errors, and to amend each component separately. The components are then resynthesized to give an updated forecast. It is shown that the errors in updated forecasts can grow more slowly than errors in normal forecasts starting from the same data time. Since updating is computationally undemanding, the technique can provide short-range forecasts which are more accurate and more economical. Tests show that updated forecasts using data valid 6 or 12 hr after the initial time are more accurate than corresponding forecasts out to 48 hr after initial time. Author (ESA)

N86-19807# Royal Netherlands Meteorological Inst., De Bilt. Afdel. Dynamische Meteorologie.
SOME DATA REDUCTION PROBLEMS IN METEOROLOGY SOLVED BY MEANS OF GRAPH THEORETICAL MODELS
H. M. deJong 1985 61 p refs
(KNMI-WR-85-5; B8573312; ISSN-0169-1651) Avail: NTIS HC A04/MF A01

A plotting problem, a superobservation problem, and a profile problem in meteorology are studied using graph theory. For the superobservation problem, an algorithm which generates solutions close to the best possible solution is proposed. Superobservations are studied using the clustering observations provided by AIDS/ASDAR during three proximate flights. Profile problem graph theory applications are described using rawinsonde and aircraft meteorological observations. The method proposed leads to a 30% reduction in the number of significant levels compared to the WMO method. Similar results for the plotting and superobservation problem are obtained. Author (ESA)

N86-19808# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
WIND SHEAR INVESTIGATION PROGRAM AT THE NLR
H. Haverdings 23 Mar. 1984 52 p refs In DUTCH; ENGLISH summary Presented at Aeronautical Symposium, Delft, Netherlands, 13 Apr. 1984
(NLR-MP-84027-U; B8571447) Avail: NTIS HC A04/MF A01

Wind shear statistics were collected from wide-body aircraft equipped with an airborne integrated data acquisition system during 9000 approaches and landings. In the resulting time dependent wind profiles, wind shear occurrences were analyzed, using a statistical discrete gust method. Flight simulation studies of F-28 aircraft landings for 8 wind profiles with different wind shear types were performed to evaluate 2 wind shear detectors. During the simulation, effort ratings of three pilots for air speed control and tracking the glide path were established. The indication of flight energy deviation is preferred above indication of this magnitude expressed in change of time. Ground and on-board indicators, including apparatus using predictive remote sensing techniques were surveyed. Author (ESA)

N86-19809# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
APPLICATION OF A LAGRANGIAN DISPERSION MODEL TO ENVIRONMENTAL PROBLEMS
D. J. Gaffen, C. Benocci, and D. Olivari Aug. 1985 38 p refs
(VKI-TM-38) Avail: NTIS HC A03/MF A01

A three dimensional Lagrangian pollutant dispersal model for passive contaminants was modified to allow simulation of dispersal of heavy gases, and moist and buoyant plumes. Outputs from a two dimensional Navier-Stokes atmospheric boundary layer solver are used. Model runs were made to simulate experimental tests of gas dispersion in atmospheric surface layers. Predicted concentration fields are in accord with measurement. Model simulation of water vapor plume dispersal in the planetary boundary layer were made using field data from cooling towers. Predicted plume rise and visible plume outline are in good agreement with observations for various meteorological and source conditions. Author (ESA)

N86-19679# European Centre for Medium-Range Weather Forecasts, Reading (England).
FOUR-DIMENSIONAL DATA ASSIMILATION INTO ATMOSPHERIC GLOBAL MODELS
L. Bengtsson *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 7-17 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-20250# Joint Publications Research Service, Arlington, Va.
ANNUAL VARIATION OF CLOUD QUANTITY AND ALBEDO Abstract Only
O. Yu. Kyarner *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 147 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 17-22 Original language document was announced in IAA as A85-29902 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N86-19810 California Univ., San Diego.
SHOALING SURFACE GRAVITY WAVES Ph.D. Thesis
Stephen Laurence Elgar 1985 138 p
Avail: Univ. Microfilms Order No. DA8517899

Aspects of the nonlinear evolution of nonbreaking ocean surface gravity waves shoaling between 9 m and 1 m water depths are investigated. Wave group statistics predicted by several approximate linear theories are compared to numerical simulations and it is found that these theories are not generally valid for ocean data due to assumptions beyond linearity and random phase. The simulations also provide information about the variability of linear wave group statistics. The simulation technique is used to show that in 9 m depth the observed wave group statistics are not inconsistent with an underlying wave field composed of linearly superposed random waves. A unidirectional nonlinear model based on Boussinesq type equations is shown to more accurately predict the evolution between 4 and 1 m depths of energy spectra, coherence and phase speed between sensors, and wave group length than linear finite depth theory which includes the effects of the directional distribution of energy. Bispectral analysis is employed to isolate and study nonlinear interactions within a shoaling wave field. Phase coupling between the power spectral peak and higher harmonics is clearly evident. Bispectral calculations provide evidence for the execution of Fourier modes via difference as well as sum interactions in a wave field with a double-peaked spectrum. Bicoherence values indicate that surf beat motions are coupled to higher frequency modes within the power spectral peak. Dissert. Abstr.

N86-19811# Naval Postgraduate School, Monterey, Calif.
MIZLANT 81 DATA REPORT RESULTS OF AN OCEANOGRAPHIC CRUISE TO THE GREENLAND SEA, OCTOBER AND NOVEMBER 1981 Interim Report, 1 Oct. 1980 - 31 Dec. 1981
R. H. Bourke and R. Paquette Aug. 1985 78 p
(AD-A159709; NPS68-85-020) Avail: NTIS HC A05/MF A01 CSCL 08/10

This report presents plots of property profiles for each of the 122 oceanographic stations occupied by the U.S. Coast Guard Icebreaker over the continental shelf and slope waters off the east coast of Greenland in October and November 1981. A Neil Brown Mark III CTD was used to obtain temperature and salinity

profiles to the sea floor in shallow water and at least to 600 m in deeper water. In addition to temperature and salinity profiles, plots of sound speed and density (sigma-t) are shown. GRA

N86-19812# Science Applications International Corp., La Jolla, Calif.
INTEGRATED REPORT ON MECHANISMS RESPONSIBLE FOR NARROW ANGLE v-WAKES IN THE GEORGIA STRAIT EXPERIMENT Final Report
E. D. Brown Jun. 1985 30 p
(Contract N00014-83-C-0438)
(AD-A159892) Avail: NTIS HC A03/MF A01 CSCL 20/4

The Georgia Strait Experiment was designed to identify the mechanisms responsible for SAR imaging of narrow angle v-wakes. SAR overflights were coordinated with surface measurements of environmental conditions and of wave height and slope within a ship wake. Narrow v-wakes were observed by and L-band aircraft SAR with incidence angles of 20 - 50 deg, under low ambient wind conditions for all relative orientations between the SAR and ship tracks. These V-lines are a few pixels wide (approx 10 m), several kilometers in length, and approx. 17 dB above the background radar backscatter at a distance of 1 km behind the ship. Surface measurements and modeling analysis from this experiment demonstrate that these v-wakes are unrelated to ship-generated internal wave wakes. The qualitative features of L-band v-wakes are consistent with first order Bragg scattering from intermittently generated ship surface waves. This report reviews the theoretical basis and the experimental evidence supporting this mechanism. GRA

N86-19813# Naval Polar Oceanography Center, Washington, D.C.
EASTERN-WESTERN ARCTIC SEA ICE ANALYSIS, 1984
Sep. 1985 109 p
(AD-A159906; RR-11) Avail: NTIS HC A06/MF A01 CSCL 08/12

These are approximately 7-days analysis of sea ice prepared by the Naval Polar Oceanography Center, Suitland, MD. Included are ice concentration and ice thickness (age). GRA

N86-19814# Naval Polar Oceanography Center, Washington, D.C.
ANTARCTIC ICE CHARTS, 1983-1984
Sep. 1985 215 p
(AD-A159907; RR-6) Avail: NTIS HC A10/MF A01 CSCL 08/12

This publication is the sixth in a continuing bi-yearly series of Antarctic sea ice atlases prepared in the Joint Ice Center at the Naval Polar Oceanography Center, Suitland. The Atlas contains weekly charts depicting Southern Hemisphere ice conditions and extents. The information presented was prepared under operational time constraints principally from satellite imagery supplemented by conventional observations. Table 1, located on the inside back cover, summarizes satellite data availability for 1983 and 1984. GRA

N86-19815# Naval Postgraduate School, Monterey, Calif.
ON THE DETECTION OF A 40 TO 50 DAY OSCILLATION IN SEA SURFACE TEMPERATURE ALONG THE CENTRAL CALIFORNIA COAST
L. C. Breaker and P. A. W. Lewis Sep. 1985 18 p
(RR0-1405)
(AD-A160391; NPS55-85-025) Avail: NTIS HC A02/MF A01 CSCL 08/10

Previous studies of the tropical troposphere indicate the presence of a 40 to 50 day oscillation in zonal winds. Spectral analysis of sea surface temperature reveals an increase in variance between 40 and 50 days along the California coast as far south as Santa Barbara (34.4N) and at least as far north as Pt. Arena (39N). Increases in the amplitude of this oscillation at 36N generally coincide with local El Nino warming episodes. It is suggested that the 40 to 50 day oscillation in sea surface temperature off central California may be related to the 40 to 50 day oscillation in the tropical troposphere through atmospheric teleconnections between the tropics and mid-latitudes. Author (GRA)

N86-19816# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF SOUND VELOCITY VARIATION IN AN ESTUARY FOR NOS (NATIONAL OCEAN SERVICE) STANDARDS M.S. Thesis
John D. Wilder Sep. 1985 84 p
(AD-A160929; AD-F630624) Avail: NTIS HC A05/MF A01 CSCL 20/1

Investigation of oceanographic data acquired in the Columbia River estuary, which lies the states of Washington and Oregon, revealed significant variation in sound velocity with respect to time and location. National Ocean Service (NOS) standards for echo-sounder acquired soundings require the knowledge of sound velocity to within plus or minus 4 meters per second. To meet this requirement in the Columbia River estuary, methods were devised to allow prediction of sound velocity based on location and the height of tide. Confidence intervals associated with sound velocity predictions provided by regression analyses showed a substantial improvement in accuracy when compared to using a single average velocity for each location. Nevertheless, there were still some cases where the NOS requirement could not be met. GRA

N86-19817# Lee (J. S.) Associates, Inc., Arlington, Va.
OCEAN SURVEILLANCE DETECTION STUDIES. PART 1. DETECTION IN GAUSSIAN MIXTURE NOISE. PART 2. AN INVESTIGATION OF CANONICAL CORRELATION AS AN AUTOMATIC DETECTION AND BEAMFORMING TECHNIQUE Final Report, 1 Jan. - 30 Sep. 1985
Jhong S. Lee, Leonard E. Miller, Robert H. French, and Young K. Kim Oct. 1985 271 p
(Contract N00014-85-C-0091)
(AD-A160931; AD-F630624; JC-2034-N) Avail: NTIS HC A12/MF A01 CSCL 17/1

In Part I, noncoherent detection of narrowband signals in Gaussian-Gaussian mixture noise is considered. The forms of the optimum detectors are found and evaluated for single and multiple observations. These detectors are sensitive to information on the signal and noise parameters. Also evaluated are several suboptimum detectors which perform well under certain conditions without requiring knowledge of signal and noise parameters. In Part II, a new technique for detecting signals using arrays of sensors is investigated, based on the principles of canonical correlation. The theoretical results indicate that for a sufficient number of sensors, multiple, spatially separate signals, at the same frequency can be individually detected without knowledge of sensor position or using conventional beamforming. If sensor positions are known, the algorithm supplies the direction of the signal arrivals. The limited numerical results show that a few sensors can automatically steer on and detect a single signal, but are incapable of resolving multiple signals successfully. GRA

N86-19818# Naval Postgraduate School, Monterey, Calif.
COUPLED MIXED LAYER-ACOUSTIC MODEL M.S. Thesis
John J. McManus Sep. 1985 51 p
(AD-A160952) Avail: NTIS HC A04/MF A01 CSCL 08/10

A coupled ocean mixed layer-acoustic model is evaluated in two dimensions at a line of stations in the northeast Pacific Ocean. The Oceanic Boundary Layer Model (OBL) is initialized using bathythermograph data acquired during the 1980 Storm Transfer and Response Experiment (STREX). The OBL model was used to predict a new thermal profile after integrating in time for 20 days. This was then compared with actual bathythermograph data taken 20 days later. Three cases were examined: initial, model, and final data as input to the RAYMODE acoustic model. The acoustic performance for the three cases was measured median detection range (MDR) and convergence zone range (CRZ). In the absence of strong horizontal advection, over a 20 day period the OBL can predict surface temperature to within an average of 0.5 C. Therefore the coupled models can be used effectively to help predict MDR and CZR in a tactical situation. GRA

N86-19819# Naval Postgraduate School, Monterey, Calif.
TEST AND EVALUATION OF AN IMPROVED SEA, SWELL AND

SURF PROGRAM M.S. Thesis
Michael J. Gill Sep. 1985 129 p
(AD-A161023) Avail: NTIS HC A07/MF A01 CSCL 08/3

In this thesis a sea swell and surf program is improved, tested and evaluated on a micro-computer (HP-9845B). Sea swell is calculated by a two dimensional spectral model. The energy balance equation is tested for different cases of wind velocities and water depths. Satisfactory agreement is observed between the offshore model and expected wave heights for a 15 knot wind, but the model overbuilds wave energy for a 30 know wind. Wave transformation is described by a one dimensional random wave model in which the wave heights are described using the Rayleigh distribution. The obtained solution of the random wave field is used to predict the longshore currents. An empirical formula for determining the breaker parameters is developed, based on beach slope and incident wave steepness. The improved model is tested using an undulated bathymetry to validate the model physics. The model outputs of wave height and current are compared with data acquired from a wave tank and natural beaches. The model is found to accurately forecast wave heights, breaker location, breaker type and longshore currents for several sets of conditions. Model limitations are discussed and recommendations for further improvement are made. GRA

N86-19820# Colorado School of Mines, Golden. Center for Wave Phenomena.
SELECTED RESEARCH PROGRAM OF THE OFFICE OF NAVAL RESEARCH AT THE CENTER FOR WAVE PHENOMENA, COLORADO SCHOOL OF MINES Progress Report
Norman Bleistein, Jack K. Cohen, Frank G. Hagin, and John A. DeSanto 1 Oct. 1985 49 p
(Contract N00014-84-K-0049)
(AD-A161040; CWP-037) Avail: NTIS HC A03/MF A01 CSCL 08/11

This is a progress report on the current status of the research program of the Center for Wave Phenomena at the Colorado School of Mines. There have been two major research projects in inverse scattering under the Selected Research Opportunities Program. The first of these is reflector imaging for seabed mapping and seismic exploration. The second is ocean profile inversion. (1) Our research group is committed to the practical solution of inverse problems. Sullivan's modeling technique will be used to generate synthetic data for testing of inversion algorithms. Direct modeling of this sort is also used to test the output of migration and inversion algorithms on real data. (2) The second research project studies ocean soundspeed profile inversion, in the case of a soundspeed which is dependent on depth, only. This inversion problem is fundamentally different from the seismic problem. The source(s) and receiver(s) are separated laterally while the variation being sought is a function of the vertical variable, nearly orthogonal to the ray paths of propagation of the signals. An integral equation for the perturbation of the soundspeed from a reference speed is formulated. The inversion of the integral equation actually provides a solution for n'(z) rather than for n(z). The solutions obtained to date by this method, properly locate the perturbation. However, n'(z) exhibits an overshoot of the type usually associated with Gibbs phenomenon. Methods of integration of n'(z) which minimize this affect are presently being investigated. GRA

N86-19821# Wisconsin Univ., Madison. Mathematics Research Center.
THE ASYMPTOTIC BEHAVIOUR NEAR THE CREST OF WAVES OF EXTREME FORM Technical Summary Report
J. B. McLeod Aug. 1985 10 p
(Contract DAAG29-80-C-0041)
(AD-A161064; MRC-TSR-2856) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper concerns waves of permanent form on the free surface of an ideal liquid which is in two-dimensional, irrotational motion under the action of gravity. It considers only extreme waves, often called waves of greatest heights; each of these is the end-member of a one-parameter family of waves and is distinguished from other smaller members of the family by a sharp crest. Although this corner is physically unrealistic, oceanographers have given such idealised, extreme waves a great deal of attention since Stokes postulated their existence in 1880. This paper is a contribution to the strict mathematical theory of extreme waves, which has emerged only since 1978. An asymptotic series is known that describes the flow near the crest, but it has never been proved whether the leading term in this expansion has a nonzero coefficient or not (and so whether it is in fact the leading term or not). The author shows that the coefficient is nonzero and determines its sign. The result should play a useful part in numerical computation of extreme waves. GRA

N86-19822# Naval Postgraduate School, Monterey, Calif.
DETECTION OF SHOALS IN SEASAT SYNTHETIC APERTURE RADAR IMAGERY: SELECTED CASE STUDIES M.S. Thesis
Ronald L. Dickerman Sep. 1985 142 p
(AD-A161181) Avail: NTIS HC A07/MF A01 CSCL 08/10

Ocean-going vessels have increased in size and draft in recent years, making traditional waterways too shallow and dangerous for use, and new shipping methods and increased costs require shorter transit times. Therefore, as new shipping routes are being sought, limited hydrographic survey resources must be efficiently applied. This study sought to demonstrate the feasibility of synthetic aperture radar (SAR) imagery as a tool for hydrographic presurvey planning by analyzing SAR imagery of Shelikof Strait, Alaska. Anomalous brightness patterns visible in SAR imagery were related to interactions between ocean phenomena and bathymetric features, and an analysis of wave refraction was performed using optical Fourier transform (OFT)-measured wave spectra. The study results showed surface gravity wave refraction as measured by OFT's can be used to make quantitative estimates of water depths, generally within 40% error. Also, anomalous brightness patterns visible in SAR imagery indicate possible hazards to navigation. However, the absence of an anomalous pattern does not mean a hazard is not present. Author (GRA)

N86-19823# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF THE WATERS OF THE EAST GREENLAND CURRENT Final Report, 1 Aug. 1984 - 30 Sep. 1985
Mark D. Tunnicliffe, Robert H. Bourke, and Robert Paquette Sep. 1985 138 p
(AD-A161215; NPS68-85-025) Avail: NTIS HC A07/MF A01 CSCL 08/3

A dense network of conductivity-temperature-death (CTD) measurements made over the eastern Greenland continental shelf and slope between 81 N and 75 N provided new details on the water properties and circulation on the shelf and at the adjacent East Greenland Polar Front (EGPF). The EGPF approaches the shelf break rapidly between 80 N and 78 N remaining 20 to 30 km east of it thereafter at least until 75 N. A filament of Atlantic Water (AW) was found close to the eastern side of the front which became generally cooler with decreasing latitude, suggesting that the majority of the contribution of the West Spitzbergen Current to the southward flowing Return Atlantic Current occurs north of 78 N. The portion of the shelf investigated is cut by several troughs generally oriented east-west; two of which are joined by a north-south depression west of Belgica Bank. Dynamic topography, water properties and ice movement suggest an anticyclonic surface circulation over this system of troughs and banks with AIW advecting up the troughs from the east. GRA

N86-19824# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
CTD/O2 MEASUREMENTS DURING 1982 AND 1983 AS PART OF THE EQUATORIAL OCEAN CLIMATE STUDIES (EPOCS)
L. J. Mangum and S. P. Hayes Mar. 1985 428 p refs
(PB85-239648; NOAA-DR-ERL-PMEL-13) Avail: NTIS HC A19/MF A01 CSCL 08J

During 1982 and 1983, CTD data were collected in the eastern equatorial Pacific as part of the Equatorial Pacific Ocean Climate Studies (EPOCS) program, which began its field program in 1979. Summaries of CTD data from six cruises in 1982 and 1983 are presented. The time period spans the 1982 to 1983 El Nino-

Southern Oscillation event whose effects were seen in the eastern Pacific from August 1982 through June 1983. Station locations, meteorological conditions and profiles of temperature, salinity, sigma-T, and oxygen are shown for each cast. Additionally, T-S diagrams and section plots along 95 degs. W and the equator are presented. GRA

N86-19678# Massachusetts Inst. of Tech., Cambridge.
IMPACT OF SATELLITE MEASUREMENTS ON OCEANOGRAPHIC COMPONENT OF THE WCRP
C. Wunsch *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 3-6 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19680# Royal Netherlands Meteorological Inst., De Bilt.
INTRODUCTION TO WAVE MODELS AND ASSIMILATION OF SATELLITE DATA IN WAVE MODELS
G. J. Komen *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 21-25 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19681# Meteorological Office, Bracknell (England).
ALGORITHMS FOR WIND SCATTEROMETER PROCESSING
D. Offiler *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 27-31 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19682# Bundeswehr Munich Univ., Neubiberg (West Germany).
ALGORITHM FOR WIND SCATTEROMETER DATA ANALYSIS-AMBIGUITY SUPPRESSION
K. J. Schwenzfeger *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 35-36 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19683# Bremen Univ., (West Germany). Fachbereich 1.
MICROWAVE MEASUREMENTS OF THE SEA SURFACE
W. Alpers *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 41-45 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19684# Max-Planck-Inst. fuer Meteorologie, Hamburg (West Germany).
ASSIMILATION OF MICROWAVE DATA IN ATMOSPHERIC AND WAVE MODELS
K. Hasselmann *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 47-52 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19685# Kiel Univ. (West Germany).
INTRODUCTION TO OCEAN CIRCULATION MODELS
J. Willebrand *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 63-64 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19686# Meteorological Office, Bracknell (England). Dynamical Climatology Branch.
COMMENTS ON DATA REQUIREMENTS FOR OCEAN CLIMATE STUDIES
H. Cattle *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 67-69 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19687# Paris VI Univ. (France). Lab. de Physique et Chimie de l'Hydrosphere.
ANALYSIS AND INTERPRETATION OF ALTIMETRY DATA
J.-F. Minster *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 71-72 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19688# Imperial Coll. of Science and Technology, London (England). Atmospheric Physics Group.
ALTIMETRIC OBSERVING SYSTEM SIMULATION STUDIES WITH AN EDDY RESOLVING OCEAN CIRCULATION MODEL
J. Marshall *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 73-76 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19689# Utrecht State Univ. (Netherlands). Inst. of Meteorology and Oceanography.
SEA LEVEL AND CLIMATE VARIATIONS
J. Oerlemans *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 81-85 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19690# Max-Planck-Inst. fuer Meteorologie, Hamburg (West Germany).
SEA ICE MODELS AND REMOTE SENSING
W. D. Hibler *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 87-94 refs Sponsored by Office of Naval Research and Max-Planck Institute fuer Meteorologie, Hamburg (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19691# Institute of Oceanographic Sciences, Birkenhead (England).
ACCURACY OF EXISTING OCEAN TIDE MODELS
P. L. Woodworth *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 95-98 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19692# Technical Univ. of Denmark, Lyngby.
APPLICATION OF SAR AND OTHER REMOTE SENSING DATA IN STUDIES OF THE ATMOSPHERE-OCEAN-ICE INTERACTION
P. Gudmandsen *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 107-111 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19693# National Museum of Natural History, Paris (France). Lab. d'Oceanographic Physique.
SCIENTIFIC APPLICATION OF SAR DATA TO SEA ICE STUDIES. SEA ICE MODELS
J. C. Gascard *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 113-114 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19694# Atmospheric Environment Service, Ottawa (Ontario).
SCIENTIFIC APPLICATION OF PASSIVE MICROWAVE SATELLITE DATA FOR ICE MONITORING AND RESEARCH
I. G. Rubinstein (Ph.D. Associates, North York, Ontario) and R. O. Ramseier *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 117-123 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19695# Science Research Council, Chilton (England). Rutherford Appleton Lab.
FUTURE PASSIVE MICROWAVE SATELLITE DATA FOR SEA-ICE RESEARCH
D. L. Croom *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 125-127 refs (For primary document see N86-19677

10-42)
Avail: NTIS HC A10/MF A01

N86-19698# Science Research Council, Chilton (England). Rutherford Appleton Lab.
PRECISE SST DATA FROM SATELLITES
D. T. Llewellyn-Jones *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 139-142 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19699# Istituto di Fisica dell Atmosfera, Rome (Italy).
REMOTE SENSING OF SEA SURFACE TEMPERATURE
G. Dalu and A. Viola *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 143-145 refs Sponsored by CNR (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19700# Mullard Space Science Lab., Dorking (England).
POST LAUNCH CALIBRATION AND VALIDATION OF THE ALONG TRACK SCANNING RADIOMETER (ATSR)
I. M. Mason *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 149-150 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19701# Oxford Univ. (England). Dept. of Atmospheric Physics.
FOUR-DIMENSIONAL DATA ASSIMILATION IN TOGA MODELS
D. L. T. Anderson and A. M. Moore *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 151-153 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19702# Science Research Council, Chilton (England). Rutherford Appleton Lab.
THE USE OF AIRBORNE MICROWAVE INSTRUMENTS TO GATHER DATA FOR THE VALIDATION OF ERS-1 WIND AND WAVE PRODUCTS
R. J. Powell *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 155-156 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19703# Institute of Oceanographic Sciences, Wormley (England).
WINDS FOR CLIMATE RESEARCH FROM THE ERS-1 AND N-ROSS SCATTEROMETERS
T. H. Guymer *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 157-159 refs (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19704# European Space Agency, Paris (France).
REVIEW OF SCIENTIFIC AND TECHNICAL WORK REQUIRED BEFORE THE LAUNCH OF ERS-1: THE VIEW OF ESA
G. Duchossois, J. Louet (ESA/ESTEC, Noordwijk, Netherlands), C. R. Francis (ESA/ESTEC, Noordwijk, Netherlands), and E. Attema (ESA/ESTEC, Noordwijk, Netherlands) *In its* The Use of Satellite Data in Climate Models Sep. 1985 p 163-173 (For primary document see N86-19677 10-42)
Avail: NTIS HC A10/MF A01

N86-19705# Meteorological Office, Bracknell (England).
WIND DIRECTION AMBIGUITY SUPPRESSION ALGORITHMS
D. Offiler *In* ESA The Use of Satellite Data in Climate Models Sep. 1985 p 175-176 refs (For primary document see N86-19677 10-42)
(Contract ESA-6154/85/NL-BI)
Avail: NTIS HC A10/MF A01

N86-20267# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF USING SATELLITE IR-INFORMATION FOR OCEANOLOGICAL RESEARCH Abstract Only
I. V. Likhachev and A. N. Michurin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 160-161 Transl. into ENGLISH from Vestnik Leningradskogo Universiteta: Geologiya, Geografiya (Leningrad, USSR), no. 14, issue 2, Jun. 1985 p 93-95 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N86-19825# New Mexico Univ., Albuquerque. School of Medicine.
ULTRASENSITIVE DETECTION OF CHEMICAL SUBSTANCES Quarterly Report, 1 Jun. - 31 Aug. 1985
R. G. Dean 31 Aug. 1985 4 p
(Contract N00014-82-K-0680; ARPA Order 4507)
(AD-A159996) Avail: NTIS HC A02/MF A01 CSCL 06/1

In this reporting period we have continued to characterize monoclonal antibodies against AChE-DFP. We have focused attention three monoclonals of interest. These are the V-16 antibody described in our previous report and two additional antibodies designated V-18 and D11B. The V-16 antibody demonstrates higher activity against AChE-DFP conjugate than against AChE alone. The V-18 and D11B antibodies showed higher activity against AChE than against the conjugate. In addition, the D11B antibody blocks AChE enzymatic activity in the Elman assay. Further study showed that these antibodies exhibit a different response to AChE-DFP conjugates on the basis that the AChE ages or loses and isopropoxy residue. The resulting phosphate diester has a charge, at normal pH, on oxygen. GRA

N86-19826# Massachusetts Univ., Worcester. Dept. of Medicine.
POTENTIAL FOR CROSS-REACTIVE PROTECTION USING PEPTIDES AND ADJUVANTS OR CARRIER MOLECULES Annual Report, 1 May 1984 - 30 Apr. 1985
F. A. Ennis 1 Oct. 1985 8 p
(Contract N00014-83-K-0357; RR0-401)
(AD-A160360) Avail: NTIS HC A02/MF A01 CSCL 06/5

We have demonstrated that a conserved portion of the HA2 subunit on the influenza virus hemagglutinin can induce a cytotoxic T lymphocyte response. This is a major development since it raises the possibility that this type of peptide could be used to provide protection that would be cross-reactive among influenza virus strains. The peptide we used was produced in E. coli using recombinant DNA techniques for the expression of segments of influenza viral genome. The molecule which stimulates this H-2 restricted cytotoxic T lymphocyte response is a fusion protein of the HA2 subunit of H1 virus (A/PR/8/34 H1N1), and the induced lymphocytes kill target cells infected with strains of influenza A virus possessing the H1 hemagglutinin irregardless of the years isolated (e.g. 1934, 1978), the results indicate that the HA2 subunit is a candidate for cross-reactive protection because there are substantial published data indicating that influenza virus induced cytotoxic T lymphocytes (Tc) are protective in challenged recipients. GRA

N86-19827# Texas Univ., Dallas. Center for Communication Disorders.
THE EFFECT OF IMPULSE INTENSITY AND THE NUMBER OF IMPULSES ON HEARING AND COCHLEAR PATHOLOGY IN THE CHINCHILLA
James H. Patterson, Jr., Ilia M. Lomba-Gautier, and Dennis L. Curd Jun. 1985 191 p
(Contract DAMD17-80-C-0109; DA Proj. 3F1-62777-A-878)
(AD-A161230; USAARL-85-3) Avail: NTIS HC A09/MF A01 CSCL 06/19

Forty-one chinchillas, divided into seven groups, were exposed to 1, 10, or 100 noise impulses having peak intensities of

131 dB, 135 dB, 139 dB or 147 dB. Hearing thresholds were measured in each animal prior to exposure using an avoidance conditioning procedure. Threshold shifts were monitored at regular intervals over a 30 day postexposure period. A surface preparation of the cochlear sensory epithelia was performed approximately 90 days after exposure. There was generally an orderly relaxation between the amount of permanent threshold shift and the severity of exposure, and a general agreement between averaged histological data and the audiometric data. Detailed relations between temporary and permanent threshold shift, cochlear pathology, and exposure variables are discussed, as are the implications of these data to the development of exposure criteria. All tabulated individual animal data, averaged group data, and individual cochleograms are presented in Appendixes A through D. GRA

N86-19826# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
2 Jan. 1986 108 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-001) Avail: NTIS HC A06

A literature survey of life sciences, biomedical sciences, and behavioral sciences in the U.S.S.R. is presented. Some areas covered are agrotechnology, biochemistry, biophysics, biotechnology, environmental protection, epidemiology, food technology, genetics, human factors and immunology. Other areas are laser effects, medicine, microbiology, pharmacology and toxicology, physiology, public health and radiation biology. For individual titles, see N86-19829 through N86-19849.

N86-19829# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF EFFECTS OF MICROBIOLOGICAL MEANS OF PLANT PROTECTION ON ORGANISM
I. A. Ivanova *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 1-9 refs Transl. into ENGLISH from Izvestiya Akademii Nauk Latviyskoy SSR (Riga, USSR), no. 6, Jun. 1985 p 76-81 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The microbiological method of combatting pests is very promising, which is explained by the ever growing interest in it in many countries. Nevertheless, before permitting the use of microbiological agents, it is necessary to thoroughly study the characteristics of microorganisms artificially introduced into the environment. Therefore, studying the effects of biological means of protecting agricultural crops on man and warm blooded animals is of scientific and practical interest. This emphasizes the importance of the correct approach to normalizing microbe preparations, which is of great importance not only from the point of view of hygiene and occupational pathology, but also of environmental protection. These effects of microorganisms on man and the environment are studied. Author

N86-19830# Joint Publications Research Service, Arlington, Va.
COMPUTER GRAPHICS EMPLOYED IN MODELING PROTEIN MOLECULES **c60**
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 10 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 5 Sep. 1985 p 4 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

A computer aided method for modeling the structure of molecules will become a new tool for probing the secrets of matter. The method makes it possible to produce pictures of molecules of complex protein compounds on the screen of a terminal. The computer draws any of 250 molecules, whose diagrams, consisting sometimes of many thousands of coordinates, are stored in an electronic data bank. These drawings can be rotated in all planes and enlarged or reduced; different parts of them can be isolated, and cross-sections can be shown. For great clarity, atoms are colored in contrasting shades, and halftones create a three dimensional effect. Author

N86-19831# Joint Publications Research Service, Arlington, Va.
MICELLAR ENZYMOLOGY Abstract Only
K. Martinek, A. V. Levashov, N. L. Klyachko, Yu. L. Khmelnitskiy, and I. V. Berezin *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 11 Transl. into ENGLISH from Biologicheskiye Membrany (Moscow, USSR), v. 2, no. 7, Jul. 1985 p 669-695 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

In nature, enzymes function primarily in complex ensembles involving lipids, proteins, polysacchardies and other molecular components in solutions in which water is not the only dominant component. Enzyme catalysis therefore occurs in a microheterogeneous medium in which water acts as a regulator, determining the supermolecular structure of the catalytic reactor. Possible experimental methods of modeling the enzyme functions under such conditions are discussed, with particular attention given to such systems as proteolipid complexes and enzymes in organic solvents solubilized with phospholipids or detergents. The tasks of micellar enzymology are formulated and its relationship to membranology is discussed. The tasks include the study of the catalytic properties of solubilized enzymes as a function of degree of hydration; use of natural lipids as micelle forming components, allowing study of the mechanisms of regulation of lipid dependent enzymes; study of the interaction of enzymes in substrates insoluble in water; investigation of the dynamics of enzyme processes under conditions such that the substrate is distributed between water and organic solvents; study of cryoenzymatic processes occurring below the freezing point of water; and modeling of elementary biomembrane structure fragments with hydrated associations of protein and amphiphilic compound molecules. Author

N86-19832# Joint Publications Research Service, Arlington, Va.
FLUORESCENT-POLARIZATION PROPERTIES OF CHROMOPHORES OF WATER-SOLUBLE PROTEINS OF NORMAL AND CATARACTAL HUMAN LENS **c52**
T. V. Birich, N. I. Poznyak, N. A. Prokoshina, and S. N. Cherenkevich *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 21-24 refs Transl. into ENGLISH from Doklady Akademii Nauk BSSR (Minsk, USSR), v. 29, no. 8, Aug. 1985 p 757-759 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The fluorescent properties, including the lifetime of the excited state of the molecules and the degree of polarization of fluorescence of the water soluble proteins of the normal and cataractal human lens cortex and nucleus are studied. The water soluble fraction of the proteins of the lens cortex and nucleus obtained after homogenization in physiological solution and subsequent centrifuging at 6000 g for 20 min. was also studied. All the studies were done at room temperature. The spectral fluorescent properties including the fluorescence lifetime and polarization of water soluble cortex and nucleus proteins are found to be different in normal and cataractal human lenses. The origin of chromophores which are emitted in the visible spectral range and the modification of protein structure are associated with the formation of intra- and intermolecular covalent bonds in proteins. Author

N86-19833# Joint Publications Research Service, Arlington, Va.
ELEMENT ANALYSIS OF SCLEROTIC FORMATIONS OF MAJOR BLOOD VESSELS BY LASER MASS SPECTROMETRY Abstract Only **c52**
G. G. Arabidze, S. M. Burkitbayev, Yu. A. Bykovskiy, A. I. Kutsenko, I. D. Laptev, E. A. Manykin, Ye. A. Petrenko, and V. T. Timoshin *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 29 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 655-660 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The element and isotope composition as well as changes in natural propagation of isotopes of elements in sclerotic (plaque) formations developing on the walls of the blood vessels in atherosclerosis is studied by laser mass spectrometry. Sections

of sclerotic arteries in various stages of development of atherosclerosis were studied. Before placement in the ion source chamber, the specimens were dewatered with 10% formalin solution and by exposure to various concentration of tartaric acid, then dried at 37 C and atmospheric pressure. Experiments showed that atherosclerotic plaque consists of 12 to 16 elements. The total content of isotopes of the macrocomponents was determined mathematically. Significant changes in the content of trace elements were observed in various stages of vascular damage, anomalous disorders in the natural distribution of isotopes of oxygen, silicon, magnesium and calcium were observed in various stages on the development of atherosclerosis. Author

N86-19834# Joint Publications Research Service, Arlington, Va.
CLINICO-EPIDEMIOLOGICAL CHARACTERISTICS OF Q FEVER IN CARPATHIAN FOOTHILLS c52
A. A. Sukhopyatkina, O. S. Bat, A. V. Levitskaya, and V. G. Potapova *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 34-36 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, April 1985 p 80-81 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The polymorphism and relative lack of severity of the clinical course of Q fever, as well as the multiplicity of ways of its transmission, lead to a situation in which this disease can go unrecognized. In connection with this, deeper study of the characteristics of its epidemiology are making it possible to establish the presence of natural and anthropurgic foci of this infection. The epidemiological investigation of Q fever was begun in 1975 and have continued to study the infection of the population. In 1975 blood serum from 216 individuals was studied in a complement fixation test with Coxiella burnetii, with negative results. In 1976, 2.1 percent of those examined were found to have a complement-binding antibody to C, burnetti in titers of 1:10 to 1:80. It was established that in one of the rayons of the oblast there existed an active anthropurgic focus of Q fever, manifested by group illness of the personnel working on dairy farms. The source of the infection for people was cattle, and the main method of transmission of the infection was aerogenic. A higher rate of infection by Q fever was observed among workers in livestock raising farms and meat combines. Author

N86-19835# Joint Publications Research Service, Arlington, Va.
EPIDEMIOLOGICAL SUPERVISION OF POLIOMYELITIS c52
Yu. I. Vaserin, L. V. Vaserin, R. G. Vlasova, R. G. Balakireva, S. F. Zakirova, N. V. Patsuk, and N. Ya. Venediktova *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 37-42 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 81-85 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The events of the last decade have shown that under conditions of mass vaccination various regions of our country record isolated cases and outbreaks of poliomyelitis. A thorough description has been made of a period of epidemic increase in the rate of poliomyelitis in Sverdlovsk in 1969 to 1972, when epidemiological, virological, and serological methods were used to establish the polio virus etiology of most of the cases of paretic diseases. Some conclusions reached because of this monitoring are: (1) under conditions of mass vaccination, sporadic cases of poliomyelitis can be observed among inoculated children; (2) development of a program of epidemiological supervision of poliomyelitis for each administrative region has been proven necessary; and (3) epidemiological supervision of poliomyelitis should provide for early and complete discovery of all cases of the infection, regardless of the severity of the illness, analysis of the quality of vaccination, and determination of the immune status of the population of children and the characteristics of circulation of polio viruses. Author

N86-19836# Joint Publications Research Service, Arlington, Va.
IMPROVING COMMERCIAL AIRCRAFT TRAINING SIMULATORS c05
V. Goryachev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 48-49 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 10 Sep. 1985 p 3 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

Studies of the use of technical means of instruction was begun in 1976. Results of this research indicated that training with simulators could take the place of flight training of crews in preparation for spring and summer flight operations. Instructions from the Ministry of Civil Aviation to this effect were issued in 1977. This change has proved effective. Effective use of comprehensive training simulators has become an important way of saving fuel. Flight training in flight schools still takes up a large portion of their time, the benefit yielded by helicopter training simulators still is not large enough, and possibilities exist for reducing unproductive flight time in a whole series of training programs for flight crews. Author

N86-19837# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF REACTOGENIC AND ANTIGENIC ACTIVITY OF CHROMATOGRAPHICALLY PURIFIED, CONCENTRATED AND INACTIVATED DRY VACCINE AGAINST TICK BORNE ENCEPHALITIS Abstract Only c52
O. V. Popov, A. A. Sumarokov, R. Ya. Shkolnik, L. B. Elbert, M. S. Vorobyeva, G. L. Krutyanskaya, A. V. Razgulyayeva, and M. N. Rasshchepkina *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 51-52 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 6, Jun. 1985 p 34-39 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

It is shown that the new concentrated chromatographically-pure (CCP) vaccine against tick borne encephalitis (TBE) had moderate reactivity in doses of 0.5 and 1 ml. A direct relationship was established between the frequency and intensity of postvaccination reactions of the vaccinated individuals and the dose. The highest indices of reactivity in individuals treated with CCP vaccine were noted after the first vaccination. CCP vaccine has high antigenic activity: virus-neutralizing antibodies are found in twice vaccinated individuals in 97 to 100% and antigen agglutinations in 75 and 91% respectively. This vaccine should be used for primary vaccination against TBE using two 0.5 ml injections 6 months apart. Author

N86-19838# Joint Publications Research Service, Arlington, Va.
LIGHT INDUCED DAMAGE TO ERYTHROCYTE MEMBRANE SENSITIZED BY TETRASULFOPHENYL PORPHIN
A. V. Vorobey, T. N. Vadetskaya, G. D. Yegorova, and Ye. A. Chernitskiy *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 54-57 refs Transl. into ENGLISH from Vestsi Akademii Navuk BSSR: Seriya Biyalahichnykh Navuk (Minsk, USSR), no. 4, Jul. - Aug. 1985 p 103-105 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

In recent times researchers have displayed a great interest in the possibility of using porphyrins for the diagnosis and photoradiation therapy of malignant neoplasmas. At the same time, there is great optimism regarding the use of hydrophilic porphyrins also. In order to devise effective methods of photoradiation therapy, it is necessary to investigate the mechanism of the photosensitized forms of cell damage. One of the basic targets of such damage is the cell membrane. The structural-functional changes in the erythrocyte membrane were studied by irradiating a suspension of erythrocyte shadows with red laser light in the presence of the hydrophilic porphyrin methyl-tetra(n-sulfophenyl)porphin. The photodamage to the lipids was determined from the accumulation of the products of their peroxidation. The photodamage to the proteins from the formation of crosslinks of the polypeptide membranes. The photodamage to the functional properties of the membrane was evaluated on the basis of the reduction of their

permeability barrier, and by the inhibition of the transportation of glucose and pyruvate. Author

N86-19839# Joint Publications Research Service, Arlington, Va.
COVALENT CROSSLINKS BETWEEN FILAMENTS IN DNA INDUCED BY LASER Abstract Only
G. B. Zavilgelskiy, G. G. Gurzadyan, and D. N. Nikogosyan *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 58 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 568-570 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

A study was made of the formation of covalent crosslinks and local denatured sectors in DNA under the influence of picosecond pulses of UV laser radiation. The kinetics of formation of these defects were studied by a fluorescent method using acridine orange dye, which forms complexes with DNA. Radiation at 266 nm was used with a pulse repetition frequency of 0.3 Hz, pulse length 30 ps, intensity 10 to the 11th power to 10 to the 14th power W/sq m. The molecular weight of the phage C DNA used in the studies was about 4 X 10 to the 7th power daltons, diluted in the phosphate buffer pH 7.2 to a concentration of 15 micrograms/ml. The quantum yield of crosslinks is about 1.0 X .000001 over the entire range of intensities of -.1 to 10 to the 11th power W/sq m. At intensities of over 10 to the 11th power sq m. the quantum yield of crosslinks increases by an order of magnitude, to 1.0 X .00001 at 4.10 to the 13th power W/sq m. Author

N86-19840# Joint Publications Research Service, Arlington, Va.
EXHIBITS CONCERNING SPARING MEDICINE AT ZDRAVOOKHRANENIYE-85 AT MOSCOW Abstract Only **c52**
Ye. Ponarina *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 59-60 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 3 Aug. 1985 p 4 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

Exhibits concerning sparing therapy, displayed in Moscow, are listed and described briefly. The Delta-102 relieves pain without use of other analgesics by preventing pain impulses from entering the brain and by inciting release of endorphin. Akma magnets are helpful in alleviating migraine, toothache, sciatica, insomnia and can be used to assist efforts to stop smoking. The patients themselves fasten the magnets to acupuncture points. The Ritm EKG device takes readings from 64 points rather than the usual six and the data obtained are processed and displayed automatically. The comprehensive, automatic, republic system for mass physical examinations Kasmon employs electronic devices to allow one physician and 10 nurses to examine 13,000 patients. The Kardiolayn device can be used to monitor physical parameters of patients after release by their physician. Other exhibits demonstrated surgical procedures employed to perform unique eye surgery procedures, the use of plasma jet scalpels and a method of kidney stone treatment by shock waves in which the patient is subjected to shock waves after precise location of the stone and immersion in water. Author

N86-19841# Joint Publications Research Service, Arlington, Va.
MAGNETS AND SURGICAL PROCEDURES **c52**
V. Sarelyev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 62-63 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 23 Aug. 1985 p 3 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The work of physicists, who are creating miniature magnets with great magnetic force, has permitted the widespread use of magnets in surgery. The development and introduction into clinical practice of new operations for diseases of the gastrointestinal tract and malformations of the thorax using original magnetic and mechanical systems is discussed. A multitude of different magnetic structures were specifically created for various operations. A new direction in surgery has been established. Some 5000 operations have been performed with very positive results. Author

N86-19842# Joint Publications Research Service, Arlington, Va.
MAGNETOCARDIOGRAPHY **c35**
A. Ruvinskiy *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 64-67 Transl. into ENGLISH from Leninskoye Znamya (Moscow, USSR), 21 Jul. 1985 p 4 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

Electrocardiograms and magnetocardiograms of ill and apparently well patients were made and studied. The result of the studies fully confirmed the hypothesis of the scientists: the electro and magnetocardiograms differed significantly. Whereas the electrical portrait of the heart excited no suspicion, the magnetic called attention to itself: the patient had latent pathologies. Magnetic fields are much less susceptible to distortions than are electrical signals. But magnetic diagnostics is distinguished not only by more complete and exact information. The new method is a noncontact technique--it is not necessary to apply a lot of sensors to the body of the patient and attach them there, as is the case with electrocardiography. There is a significant time savings for mass examination of patients. The method is absolutely harmless--it does not subject the person to any action and there are no adverse responses. Magnetocardiography can be used to investigate the function of the heart of a patient even if encased in plaster: the magnetic field knows no barriers. Author

N86-19843# Joint Publications Research Service, Arlington, Va.
THERMOVISUAL INDICATORS OF BRAIN RESPONSE TO VISUAL STIMULI Abstract Only **c52**
I. A. Shevelev, Ye. N. Tsykalov, A. M. Gorbach, K. P. Budko, and G. A. Sharayev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 75 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 538-543 Original language document was announced in IAA as A86-10695 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

A noninvasive thermovisual method was used to detect thermal reaction in the occitoparietal area of human brain cortex to stimulation of the eye with light from a photostimulator. The temporal, spatial, and temperature characteristics of the thermal effect were obtained by use of the AGA-780 thermovisor connected to a computer system. Possible mechanisms of the interrelationship between the visual stimuli and the thermal reaction of the human brain are discussed. I.S.

N86-19844# Joint Publications Research Service, Arlington, Va.
NEURONAL RESPONSE AND EVOKED POTENTIALS IN SUBCORTICAL FORMATIONS IN VISUAL PERCEPTION. PART 1: PROBLEM FORMULATION AND PRINCIPLES OF SOLUTION Abstract Only **c52**
Yu. D. Kropotov and V. A. Ponomarev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 75-76 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 563-575 Original language document was announced in IAA as A86-10696 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The problems of study the neurophysiological processes taking place during visual perception are discussed, including the methods used and the results obtained. The effects of visual stimuli on neuronal impulses and evoked potentials were registered in patients during functional diagnoses with the use of implanted electrodes. It was demonstrated that the processes of visual perception induce neuronal activity in the nuclei of the thalamus and striopallidal system. The nature of these reactions depends on the type of activity initiated by the visual stimuli. A system of psychological tests is proposed for the analysis of characteristic responses in the human brain to somatosensory features of visual stimuli. I.S.

N86-19845# Joint Publications Research Service, Arlington, Va.
RESPIRATORY FUNCTION IN INHABITANTS OF NORTH-EASTERN USSR Abstract Only
L. N. Matveyev, A. G. Marachev, A. N. Kozin, S. A. Kharkov, and I. Z. Sheres *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 77-78 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 634-640 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

Respiratory function analysis was conducted on 246 inhabitants of northeastern USSR with a mean stay of 9.40 + or - 0.43 years in the region, and 90 newcomers to the area from Moscow. The study groups consisted of both men and women with an average age for the cohort of 31.4 + or - 0.51 years. The long term residents of the Northeast presented with inferior pulmonary function status in comparison with the newcomers, the deterioration consisting predominantly of inferior gas-exchange parameters and reduction by a third in pulmonary reserve. Maximum gas exchange after 15 years in the northeast was reduced by 45.4% below that seen for the newcomers, and by 27.6% in comparison with immigrants with a 5 year stay. The corresponding reductions in the pulmonary reserve capacity were 45.4 and 20.3%, respectively. The morphological basis of respiratory deterioration in the long term residents of the Soviet northeast was ascribed to marked hypertrophy and hyperplasia of the seromucous glands and the increase in the percentage of goblet cells. Author

N86-19846# Joint Publications Research Service, Arlington, Va.
EFFECTS OF 24 h SLEEP DEPRIVATION ON BIOGENIC AMINE METABOLISM Abstract Only **c52**
T. D. Bolshskova, S. A. Meshcheryakova, V. F. Tyabenkova, N. I. Romanova, Ya. I. Levin, and I. G. Dallakyan *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 78-79 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 652-656 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

An analysis was conducted on the effects of 24 h sleep deprivation on the metabolism of catecholamines, histamine and serotonin and the completion of recovery after a night's sleep. Measurements of the blood and urine levels of the metabolites in question were conducted on ten healthy males ranging in age from 22 to 27 years. Sleep deprivation of the specified duration resulted in enhanced production and secretion of the biogenic amines, as evidence by elevated urinary levels. In addition, psychological tests during that time showed a positive correlation between changes in the metabolism of the biogenic amines and behavioral performance. Comparison of blood and urine levels demonstrated that the latter status provided a more reliable indication of histamine status. It was also noteworthy that serotonin levels were most refractory to recovery after sleep deprivation, and the connection between depressed levels of serotonin and mental depression after repeated bouts of sleeplessness appears to establish a direct metabolic relationship. Author

N86-19847# Joint Publications Research Service, Arlington, Va.
VISUAL FORM PERCEPTION FROM HALFTONE IMAGES Abstract Only **c52**
A. M. Kuperman and A. B. Kravtsov *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 79 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 687-689 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

Two subjects were employed in an experiment designed to test visual form perception from halftone images and evaluate the importance of orientation selective mechanisms in this function. Analysis of the resultant data indicated that the threshold time limit for perception of the volume parameter from halftone images is on the order of 70 to 180 msec, and depends on the mutual orientation of the test and masking meshwork stimuli to one another. The latency increases with orthogonal orientation. The data were interpreted to indicate that orientational and spatial frequency selective mechanisms are involved in surface form perception from halftone images. These mechanisms can be differentiated into local factors involving evaluation of intensity gradient of the test image, i.e., orientation of the normal to the surface, and nonlocal factors concerned with analysis of contour boundary characteristics. Author

N86-19848# Joint Publications Research Service, Arlington, Va.
PROBLEM OF BIOLOGICAL CLOCKS: NEW DATA ON CIRCADIAN CHANGES IN STATUS OF HUMAN ORGANISM Abstract Only **c52**
L. Ya. Glybin *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 80 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 717-720 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

A possible biochemical mechanism has been suggested for endogenous intracellular clocks, suggesting that the biological clock is not a simple two phase day and night clock, but rather a more complex sequence of circadian changes. Results are summarized in a statistical analysis of the circadian rhythm of processes of morbidity, childbirth, domestic injury, traffic accidents and death due to certain diseases. The major result is that various physiological indices of the human body change during the course of the day in a quite complex manner with a regular sequence of phases of increased and decreased intensity of the processes studied. The picture was found to be the same in terms of local time regardless of season of year, latitude or location. Five periods of elevated physiological tone were observed (at 5-6, 11-12, 16-17, 20-21 and 24-1 o'clock) with an equal number of decreases (at 2-3, 9-10, 14-15, 18-19 and 22-23 o'clock). Author

N86-19849# Joint Publications Research Service, Arlington, Va.
ENHANCEMENT OF SOMNIFEROUS EFFECTS OF THERMAL PULSATION BY SIMULTANEOUS APPLICATION TO TWO REFLEXOGENIC ZONES Abstract Only **c52**
V. A. Likhtenshteyn and T. M. Mugutdinov *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (PRS-UBB-86-001) 2 Jan. 1986 p 80 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 689-691 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

The somniferous effectiveness of simultaneous application of thermal pulses of two reflexogenic zones was tested on 33 healthy young adults, and compared with the results obtained when only the standard zone (nasolabial) or an adjunct zone (paraumbilical abdominal area) were stimulated. Depth of induced sleep was monitored by EEG. The results demonstrated that sleep induction was most effective when the two zones were simultaneously activated by thermal pulses, with 78.8% of the subjects reaching stage 2 sleep in 9.1 min on the average. In this mode only 6.1% of the subjects failed to respond. Stimulation of only the primary nasolabial zone resulted in 60.7% of the subjects entering stage 2 sleep in 12.7 min, while 15.1% failed to respond at all. Stimulation of the paraumbilical alone was least effective, with 36.3% of the subjects failing to respond and only 20.6% reaching stage 2 in 16.8 min. Author

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N86-19850* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING

BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 281)
Feb. 1986 60 p
(NASA-SP-7011(281); NAS 1.21:7011(281)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 153 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1986. Author

N86-19851 Marquette Univ., Milwaukee, Wis.
MUSCLE FATIGUE: PHYSIOLOGICAL AND BIOCHEMICAL STUDIES Ph.D. Thesis
John Patrick Troup 1985 139 p
Avail: Univ. Microfilms Order No. DA8516286

The purpose of this study was to examine the etiology of muscle fatigue in fast and slow skeletal muscles giving particular interest to the relationship of H + ion and muscle contractile properties. A further objective as to evaluate to what extent endurance and spring exercise training protects against the development of fatigue. Endurance exercise involved running 1.2 mph at a 15% grade 2 hours per day, 5 days per week for 10 weeks. The spring training program consisted of 6 sprints of 4.5 minute duration at 40 m.min-1 and 15% slope with 2.5 minute rest intervals performanced 5 days per week for six weeks. Muscle fatigue was produced in the predominantly type 1 Soleus, the type 2A and 2B extensor digitorum longus and the type 2B superficial region of the vastus lateralis by electrical stimulation in vitro at 22 C. Muscles were stimulated at 45 trains.min-1 for 1, 5 or 10 minutes. In both training modalities, train tension decreased faster in controls compared to the exercise trained group. This suggested that exercise training leads to a delay in the development of fatigue being most pronounced following a regimen of spring training. Dissert. Abstr.

N86-19852 Harvard Univ., Cambridge, Mass.
LUMINANCE AND CHROMATICITY SIGNAL PROCESSING IN THE HUMAN VISUAL SYSTEM Ph.D. Thesis
Graeme Raydon Cole 1985 154 p
Avail: Univ. Microfilms Order No. DA8520180

Luminance (Lum) and Chromatic (Chr) detection mechanisms were revealed with a 1 deg 200 ms test flash presented upon a uniform 6.2 deg yellow field of 3000 td. The test could have any direction in the (L,M) cone quantal catch space. All stimulus components were narrow-band, produced with a .8-channel Maxwellian view optical system. Using pedestals which were flashed coincident in space and time with the test, subthreshold masking and facilitation was obtained for Lum tests upon Lum pedestals and Chr tests upon Chr pedestals. Further increases in the pedestal strength beyond threshold, yielded facilitation independent of the sign of the test and pedestal, followed by a Weberian rise in threshold. Suprathreshold +/- Lum pedestals facilitated the detection of +/- Chr tests (+Chr = green; -Chr = red) by 2 to 3 fold. The facilitation was still apparent for tests and pedestals which were tilted away from the nominal Chr and Lum directions respectively. The results are discussed in terms of spatio-temporal uncertainty and edge effects. Dissert. Abstr.

N86-19853 Minnesota Univ., Minneapolis.
RESTING METABOLIC RATE IN MEN FOLLOWING PROLONGED TREADMILL EXERCISE Ph.D. Thesis
Gene Ronald Shaw 1985 162 p
Avail: Univ. Microfilms Order No. DA8519297

Previous studies have suggested that the resting metabolic rate (RMR) may be elevated for several hours following prolonged exercise and thus contribute significantly to 24-hour energy expenditure. The metabolic responses of 8 men (4 trained runners and 4 sedentary men) were studied during and after treadmill exercise. Each subject was studied on 8 different days: 3 control days (no exercise), 3 days following 45 min of exercise, and 2 days following 90 min of exercise. The trained subjects' exercise intensities averaged 78% and 61% of their maximal oxygen consumption during the 45 min and 90 min exercise bouts, respectively. Corresponding values for the sedentary men were 57% and 46%. Oxygen consumption (VO sub 2), minute ventilation (V sub e), and heart rate (HR) gradually increased during 45 and 90 min of constant-load exercise regardless of training status It is concluded that the total post-exercise increase in energy expenditure following 45 or 90 min of treadmill exercise was at most 4 to 8% of the cost of exercise itself. Dissert. Abstr.

N86-19854 Research Inst. of National Defence, Stockholm (Sweden).
THE ELEVENTH ANNUAL MEETING OF THE EUROPEAN UNDERSEA BIOMEDICAL SOCIETY (EUBS) ON DIVING AND HYPERBARIC MEDICINE
Hans Oernhagen, ed. and Anne-Lie Carlsson, ed. Aug. 1985 274 p refs Meeting held in Goetborg, Sweden, 21-23 Aug. 1985 (FOA-C-50021-H1; ISSN-0347-7665) Copyright. Avail: Issuing Activity

Thermocontrol and pressure effects on divers; pulmonary function during diving and hyperbaric conditions; effects of hydrostatic pressure and gases; and decompression sickness are discussed. For individual titles, see N86-19855 through N86-19884.

N86-19855 Texas Univ., Austin.
DIVER RESPONSE TO HOT WATER LOSS AT DEPTHS GREATER THAN 300 METERS: EXPERIMENTAL OBSERVATIONS AND THEORETICAL INTERPRETATION
E. H. Wissler and A. Pasche *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 7-14 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

A mathematical model for simulating human thermal response to exercise and environmental stress is used to analyze experimental data obtained from 2 series of 350 m dives conducted in hyperbaric chambers. When divers wearing standard hot water suits were subjected to brief intervals without flow, they became uncomfortable and began to shiver within a few minutes. The physiological basis for this response and its consequences are discussed. It is concluded that nonuniform distribution of water within the suit, leakage of hot water from the suit at the wrists and ankles, and flushing of cold water into the suit around the hands and feet during a hot water cut are the primary causes of diver discomfort and shivering. Author (ESA)

N86-19856 Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Underwater Technology.
THE EFFECTS OF THE INSULATION PROPERTIES OF DIFFERENT DRY SUIT SYSTEMS ON THE DIVER'S HEAT BALANCE AND COMFORT DURING DIVING TO 50 m
D. E. Warkander, P.-A. Traeff, and G. O. Dahlbaeck *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 17-32 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

A method for quantifying thermal comfort during diving was tested during diving at 5 and 40 m using suits with and without passive insulation. Calculations of the insulation of a suit system were based on measurements of changes in body temperature, mean skin temperature, respiratory heat loss, and metabolism. Metabolism was measured with a technique based on argon dilution and mass spectrometry. Insulation values in the range of 0.10 to 0.15 K/(W/sq m) are measured for the suits, and are considered by divers to yield adequate thermal comfort. Author (ESA)

N86-19857 Bergen Univ. (Norway). Dept. of Chemistry.
A STUDY OF HUMAN LYMPHOCYTE MORPHOLOGY FROM THE PERIPHERAL CIRCULATION AFTER HYPERBARIC EXPOSURE
Judy Ann Paciorek *In* Research Inst. of National Defence The 11th Annual Meeting of the Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 33-43 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Scanning electron microscopy preparation of peripheral blood lymphocytes obtained from divers at the end of a deep dive in whole blood or in separated mononuclear cell fractions, demonstrate membrane changes in those samples that were air dried. Critical point drying of preparations prevents lymphocyte surface morphology collapse. Membrane binding studies indicated that between 24.5% of peripheral mature B and T cells binding sites are compromised after in vitro hyperbaric treatment. In vitro comparison of pre and post pressure stressed cells shows that inappropriate decompression procedures cause damage to the cytoskeletal matrix, with topographical alteration of membrane and antigenic sites. Author (ESA)

N86-19858 Tromsoe Univ. (Norway). Inst. of Medical Biology.
ENHANCEMENT OF PSEUDOMONAS AERUGINOSA VIRULENCE BY HYPERBARIC ATMOSPHERE CONDITIONS
Bjoern P. Berdal and Alain R. Eegaard *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 45-54 refs Prepared in cooperation with Norwegian Defence Microbiological Lab., Oslo (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Factors associated with Pseudomonas aeruginosa virulence (bacterial adhesion to human cells in culture, production of exotoxin A, and the activity of extracellular and cell-wall bound proteolytic enzymes) were measured under diving conditions. Toxin production remains undisturbed, but bacterial adhesion and an extracellural proteolytic, elastase-like activity increase. The enhanced adhesion associated with pressure increase is statistically significant for the assayed P. aeruginosa strains. Adhesion is much higher at 37 C than at 22 C. The hyperbaric pressure effect is significant at the higher temperature only. Observations correlate well with reports of external ear canal infections in divers and whirl-pool bathers. Enhanced bacterial adhesion under favorable atmosphere/temperature conditions could be a general phenomenon for the P. aeruginosa bacterial group. Author (ESA)

N86-19859 Admiralty Research Establishment, Gosport (England). Physiological Lab.
SOME DOMINANT FREQUENCIES OF POSTURAL TREMOR ARE LOWER AT 31 BAR
David J. Harris and Zoltan Torok *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 55-65 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

To test the hypothesis that the center frequencies of tremor bands are slightly lower at pressure as a consequence of slowed muscle contraction, tremor was studied during a heliox dive to 31 bar. Spectral analysis reveals that the power summed for the 6 to 13 Hz and 13 to 40 Hz bands in the finger increases 2 to 6 and 1.6 to 3.5 fold respectively, while hand tremor power increases from 1 to 6.6 fold. Center frequencies of all hand tremor peaks, (neurological and mechanical in origin) are reduced at pressure by 0.67 to 1.28 Hz. The results support the proposition that reflex and muscle factors play a role in causing or modulating tremor in the high pressure nervous syndrome. Author (ESA)

N86-19860 Karolinska Inst., Stockholm (Sweden). Dept. of Aerospace and Environmental Medicine.
LUNG VOLUMES AND DYNAMIC COMPLIANCE DURING IMMERSION AND OXYGEN BREATHING
R. Baer, G. O. Dahlbaeck, and U. I. Balldin *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 67-69 refs Prepared in cooperation with Chalmers Univ. of Technology, Goeteborg, Sweden (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The pulmonary mechanics and the time course of lung vital capacity (VC) reductions during immersion and oxygen breathing were investigated using 8 healthy male scuba-divers (mean age 24 yr, range 18 to 30 yr) with body plethysmographic techniques and simultaneous esophageal pressure recordings. The reductions in VC and the symptoms of airway irritation after immersion and oxygen breathing confirm suggestions that this reduction is mainly due to pulmonary absorption atelectasis formation caused by an elevated diaphragm and blood pooling in the thorax, creating closed off basal lung regions. However, the small reductions in residual lung capacity and dynamic compliance during 30 min immersion conditions, while breathing oxygen as well as air, might be explained by an increased lung interstitial fluid interfering with the gas volumes in the lung. Author (ESA)

N86-19861 Norwegian Underwater Technology Center Ltd., Laksevaag.
EFFECTS OF DRY AND HUMIDIFIED BREATHING GAS (AIR) AT 37 C ON PULMONARY FUNCTION IN HYPERBARIC CONDITIONS
I. Roennestad *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 71-79 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The effects of breathing humidified air were studied using 7 subjects performing a standard workload task at 1.17, 3.75, and 5.98 bar simulated depths and at the surface. Exposure to humidified breathing gas causes no change in any of the pulmonary function parameters. There are significant decreases in the pulmonary function parameters after exposure to dry breathing gas at 5.98 bar compared to 1.17 bar. At 1.17 bar mean mid expiratory flow (MMEF) is reduced to 94.5 % of the pre-exposure value, while MMEF at 5.98 bar is reduced to 77 % of the pre-exposure value. Data for humidified breathing gas at 5.98 bar are similar to those at 1.17 bar. Changes are probably due to an obstruction in the distal airways. The origin of the obstruction is unknown. It is concluded that humidification of dry breathing gas has an increasingly positive effect with depth on the pulmonary function of the diver. Author (ESA)

N86-19862 Research Inst. of National Defence, Haarsfjaerden (Sweden).
LUNG RUPTURE AS A COMPLICATION IN FREE ESCAPE
Claes Lindemark (Submarine Medical Section, Karlskrona, Sweden) and John Adolfson *In its* The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 81-84 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

In 104,200 free escapes performed by 9,253 trainees in submarine warfare, 63 cases (frequency of 0.7%) of lung rupture were observed. Mediastinal emphysema is found in 36 of the cases and pneumothorax in 4 by X-ray examination. Symptoms to be recompressed are thoracic sensations, cerebral symptoms, unconsciousness, subcutanous emphysema, bloody frothy sputum, auscultory crepitations, submucous emphysema and shortness of breath. It is uncommon that people trained in free ascent suffer from lung rupture. It is suggested that training in free ascent in a tank with maximum possibilities of rescue is a way to avoid severe diving accidents in the open sea. Author (ESA)

N86-19863 Institut National de la Sante et de la Recherche Medicale, Paris (France). Div. d'Exploration Fonctionnelle des Sportifs.
COMPARISON OF BRADYCARDIA BREATH-HOLD ON DIVERS AND NONDIVERS: ITS IMPORTANCE FOR THE CAPACITY VISIT OF DIVERS
D. Lapierre, F. Friemel, M. P. Curraladas, C. Larger, and G. Cannet *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 87-92 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Bradycardia during apneas with face-immersion was tested

with 12 divers and 12 nondivers. No statistically significant difference between the two groups as to the average length of breath hold and the frequency of appearance of the electrocardiographic changes is found. Breathing with face immerged (FI) cardia during apnea is significant for nondivers, FI or not. For divers, bradycardia is significant only with FI. The differences in the amplitude of bradycardia between the two groups are not statistically significant. The apnea-training of divers may reduce the parasympathetic sensitivity of the heart. During the capacity visit for candidate divers, the parasympathetic response of the subject should be tested by making him carry out an apnea. Author (ESA)

N86-19864 Red Cross Hospital, Barcelona (Spain). Centre de Recuperations i d'Investigations Submarines.

EXPLAINING THE UNEXPLAINED DYSBARIC SPORT DIVING ACCIDENTS

X. Lopez-Altimiras, J. Palomer, J. Borras, and J. Desola-Ala *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 93-98 (For primary document see N86-19854 10-52)

Avail: Issuing Activity

A total of 181 dysbaric sports diving accident case files were analyzed, and cases where adequate decompression procedures were followed were studied. The patients' personal data (age, physical condition, and background) diving instruction (experience and previous dysbaric disorders), the data which preceeded the dive (continued or successive dives, sailing, previous traveling) and the technical characteristics of the dive itself (exercise at depth, cold water, fatigue) were investigated. Exercise, advanced age, and negligence in applying safety factors are the reasons of the majority of the unexplained accidents. Author (ESA)

N86-19865 Research Inst. of National Defence, Stockholm (Sweden).

AN ATTEMPT TO COUNTERACT NITROGEN NARCOSIS BY NALOXONE ADMINISTRATION

M. H. Liner, O. Eiken, M. Gennser, H. Roeckert, and Hans Oernhagen *In its* The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 99-104 refs Prepared in cooperation with Chalmers Univ. of Technology, Goeteborg, Sweden, and Karolinska Inst., Stockholm, Swedennst. Natl. Defence (For primary document see N86-19854 10-52)

Avail: Issuing Activity

In order to evaluate the effect of naloxone (a specific opiate antagonist) on nitrogen narcosis, 8 healthy subjects were exposed to 8.5 ATA air on 2 occasions in a dry chamber. The degree of nitrogen narcosis was assessed by measurement of body sway motion, four-choice visual response time, and paced auditory serial addition test. The subjects assessed perceived degree of narcosis using the Borg category scale. Tests were performed pre and post-dive, and at bottom depth before and after drug administration. Each subject received naloxone (0.02 mg/kg bw) or placebo on separate dives. Drugs were administered intravenously in a double-blind random fashion. At 8.5 ATA performance decreases in all tests indicating nitrogen narcosis. Neither naloxone nor placebo affect performance at pressure. Results suggest that naloxone does not reverse the effects of excessive nitrogen partial pressure on body sway, and psychomotor and cognitive functions. Author (ESA)

N86-19866 London Univ. (England). Dept. of Chemical Pathology.

ELEVATIONS OF PLASMA ENDOTOXIN LEVELS AND LYSOSOMAL ENZYME ACTIVITIES IN DIVERS DURING A SIMULATED CHAMBER DIVE TO 300 msw

D. R. Doran, Z. Torok (Admiralty Research Establishment, Gosport, England), M. P. Garrard (Admiralty Research Establishment, Gosport, England), and L. Chaudry *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 107-112 refs Sponsored by UK Ministry of Defence Procurement Executive (For primary document see N86-19854 10-52)

Avail: Issuing Activity

Bacterial endotoxin levels were measured in blood samples taken from 3 men during a simulated chamber dive to 300 msw. Plasma concentrations rise in all 3 men from insignificant pre-dive values to reach levels > 10 times the upper limit of normal by the end of compression. The elevations persist well on into the decompression phase. Significant elevations of activities of acid phosphatase and Beta glucuronidase are noted, paralleling the rise in endotoxins. Such lysosomal enzyme activity increases are known to accompany endotoxaemia. The effect of hyperbaric exposure upon the efficiency of destruction of endotoxin by the liver, and/or direct effect of compression upon leakage of endotoxin from the gut are discussed. Author (ESA)

N86-19867 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Dept. of Underwater Medicine.

HIGH PRESSURE OXYGEN (OHP) INDUCED INCREASE OF SERUM PROLACTIN IS NOT DUE TO A DOPAMINE (DA)-RECEPTOR BLOCKADE

Georges Athanassenas, Roland Kaiser, Harald Schlebusch (Bonn Univ., West Germany), and Roland Berger *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 113-120 refs (For primary document see N86-19854 10-52)

Avail: Issuing Activity

A significant increase of serum prolactin (PRL) levels was found after breathing 100% O2 in a simulated depth of 18m, compared to normoxic breathing under the same conditions. In order to distinguish between a decrease of dopamine (DA) and a blockade of the DA post-synaptic receptor, bromocriptine (BRC) a known DA agonist, was administered in a double blind experiment. Eleven male divers participated in 4 series of simulated dives to 18 m breathing 100% O2 in 2 dives (1 with and 1 without BRC administration), and breathing a normoxic mixture in the 2 others (1 with and 1 without BRC administration). It is found that the increase of serum PRL under high pressure oxygen is suspended after BRC administration, suggesting that PRL increase is due to a decrease of DA rather than to a blockade of the post-synaptic DA receptor. Author (ESA)

N86-19868 Royal Netherlands Navy, The Hague. Diving Medical Centre.

EFFECTS OF INTERMITTENT EXPOSURE TO HYPEROXIA IN OPERATIONAL DIVING

W. Sterk (Vriens Diving Co.) and L. M. Schrier *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 123-131 refs (For primary document see N86-19854 10-52)

Avail: Issuing Activity

Two groups of 6 divers were exposed to hyperoxic mixtures during 3 no-stop dives of 2 hr duration per day, interrupted by 1 hr surface intervals breathing air, 5 days per week. Group 1 was exposed to 600 cumulative pulmonary toxicity dose (CPTD) and group 2 to 800 CPTD per day. Results show a chronic oxygen toxicity syndrome consisting of symptoms as fatigue, headache, dizziness, and paraesthesia. Most characteristic is a feeling of numbness in fingers and toes. It is uncertain whether these symptoms are of central or peripheral origin. It is concluded that daily exposure to 600 CPTD or more is not safe on a working week basis and as a schedule as in the experiment. Author (ESA)

N86-19869 Bergen Univ. (Norway). Dept. of Physiology.

INCREASED INOTROPI OF THE HEART IN NORMOXIC HYPERBARIC ATMOSPHERE

Linda B. Stuhr, Arne Ask, and Ingvald Tyssebotn *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 133-138 refs (For primary document see

N86-19854 10-52)
Avail: Issuing Activity

Cardiac activity of rats in a hyperbaric chamber was studied. A micromanometer independent of saline filled catheters was introduced into the left ventricular heart chamber of anesthetized subjects. Intraventricular pressure and velocity of ventricular pressure increase and decrease were measured in control and during 15 min elevated ambient pressure to 5 bar by He and N2 and 15 min after decompression. The mean arterial pressure and pulse pressure were recorded by a saline filled catheter in aorta via a femoral artery. Elevated ambient pressure (5 Bar) by N2 and He in a normoxic atmosphere increases the inotropi but does not influence the chronotropi and mean arterial pressure. It is suggested that the rat heart has to use a greater force and velocity of contraction to pump the same amount of blood at 5 bar. Author (ESA)

N86-19870 Institut za Pomorsku Medicina, Split (Yugoslavia).
HYBERBARIC OXYGEN IN THE TREATMENT OF BELL'S PALSY
Racic Goran, Denoble Petar, Gosovic Stracimir, and Kovacevic Hasan *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 139-146 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Twenty patients with Bell's palsy detected 7.6 days previously on average (no longer than 15 days) were treated by hyperbaric oxygen (HBO) at 2.8 bars for 60 min twice a day. A few days after the beginning of the therapy (mean 5.5. days) all but 1 improved and all but 1 healed completely in 17 to 21 days (mean 14.6). In one case decompression rather than HBO was indicated but subject having refused surgery joined oxygen treated group. At admission all patients presented complete paralysis with NET differing < 3.5 mA. During therapy none of them developed signs of electrodegeneration. Comparing outcome of Bell's palsy under HBO to the one under medicamentous therapy or spontaneous evolution, HBO cases heal quicker and with no sequella. Author (ESA)

N86-19871 Istanbul Medical Faculty (Turkey). Underwater Medicine Section.
A SURVEY OF ASEPTIC BONE NEGROSIS IN TURKISH SPONGE DIVERS, INTERIM REPORT
M. Cimsit, C. Babuna, A. Karacallik, G. Varan, Z. Karaguelle, B. Acunas, and N. Yuezbasloglu *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 147-157 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Physical examinations, blood and urine analyses, and radiological examinations of divers were completed. They were all actively diving on air. Mean age was 26.1 yr with a range of 19 to 35. The mean years of diving experience was 4.3. The average depth of diving was 35.4 m. Six divers had decompression sickness (DCS). Although aseptic bone necrosis is not found necessarily related with DCS, all cases with DCS have lesions of aseptic bone necrosis; 3 of the 21 divers are free of lesions and 4 have cystic changes and translucent areas in their coracoid process and fibula. Findings indicate a very high incidence of dysbaric osteonecrosis. Eighteen divers have lesions. Humerus is the primary site of affection. All these findings indicate that the high incidence of aseptic bone necrosis among Turkish sponge divers is related to diving habits. Author (ESA)

N86-19872 Slotervaartziekenhuis, Amsterdam (Netherlands).
EARLY DETECTION AND TREATMENT OF AVASCULAR BONE NECROSIS IN DIVERS
R. M. Kuipers, G. H. C. Schardijn, D. M. A. Agenant, C. A. Hoefnagel, and K. J. Hamelynck *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 159-164 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Dysbaric osteonecrosis diagnosis in divers is discussed. Four weeks after a decompression accident the first signs can be found by a diphosphonate bone-scan. An X-ray investigation is usually positive at a later stage of the disease (1 yr) but the best moment of treatment is gone. If a bone lesion is suspected on clinical examination and bone scintigraphy, further confirmation by intramedullary pressure and phlebography should be performed. In case of a high pressure and a venous stases, a core biopsy with intraossal decompression is indicated. The results of a local treatment of the necrotic part of head in early cases of femoral head necrosis are good, and less disabling than a hip arthrodesis or total hip replacement in cases of bone necrosis with secondary arthrosis. Author (ESA)

N86-19873 Chalmers Univ. of Technology, Goeteborg (Sweden). Lab. of Oral Biology.
ORAL CHANGES IN DIVERS WORKING WITH ELECTRICAL EQUIPMENT UNDER WATER
Thomas Oertendahl *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 165-171 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

An inquiry study among professional commercial divers revealed that 55% complained of a metallic taste, strictly related to their work with electrical equipment under water. A clinical study was performed to see if the metallic taste reflected any clinical alteration. Divers who worked with electrical equipment under water have a significantly more unfavorable clinical appearance of their dental amalgams, in relation to a control group. The metallic taste is probably due to potential alterations in the mouth provoked by increasing humidity in diving suits when operating electrical welding machines. Author (ESA)

N86-19874 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Dept. of Underwater Medicine.
HYGIENIC ASPECTS OF WATER SUPPLY FOR CHAMBER SANITARY FACILITIES, CHANGES OF DIVERS' BACTERIAL MOUTH FLORA AND EFFECTIVENESS OF EAR PROPHYLAXIS IN SATURATION DIVES
R. Kaiser, L. Krizek (Bonn Univ., West Germany), M. Exner (Bonn Univ., West Germany), and L. Vogt *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 173-178 (For primary document see N86-19854 10-52)
Avail: Issuing Activity

In the first of two 230 m saturation dives a continuous spreading and increase of Pseudomonas aeruginosa (mainly PMA 4) was observed inside the chamber although a strict daily disinfection routine was followed. Beginning between day 3 and 5, PMA 4 is observed in all divers. Technical modifications to the water sypply system and the use of a H2O2 based disinfectant markedly improve microbiological water quality and reduce bacterial colonization of the divers in the second dive. For ear prophylaxis (5 min twice daily) 70% ethanol or AL-acetate/acetic acid was used. No case of manifest otitis externa occurs. Author (ESA)

N86-19875 Bergen Univ. (Norway). Inst. of Physiological Psychology.
PSYCHOLOGICAL AND PHYSIOLOGICAL STRESS REACTIONS AMONG SPORTS DIVER-STUDENTS
Arvid Jensen, Ragnar Vaernes, and Kjell-Torgeir Stokke *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 179-189 refs Sponsored in cooperation with Norwegian Underwater Technology Center and National Hospital of Norway (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The existence of a significant activation or stress to perform

emergency procedures in water, and coping throughout dive training were studied. Pre and post activation on dives 1 and 6 were measured (5 m depth). Correlations between endocrine reactions, subjective fear rating, frequency of symptoms postdive and personality were obtained. There is a significant activation to the sea dive. However, students either really cope with the environment, or show a very large change in endocrine status. There are broad individual variations regarding coping throughout training. As found among navy divers loss of coping is related to high defense strategies. Author (ESA)

N86-19876 Hamilton Research Ltd., Tarrytown, N.Y.
REPETITIVE DECOMPRESSION TABLES FOR NO-STOP EXCURSIONS FROM SATURATION
R. W. Hamilton and D. J. Kenyon *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 191-198 refs Sponsored by NOAA and the Dept. of Commerce (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The classical gas loading method for calculating repetitive tables was used to calculate many sequences of excursions separated by various surface or habitat intervals. These were done for different excursion storage depths, vertical excursion distances, and interdive intervals. The allowable bottom time may be shorter for the second dive and even shorter for subsequent excursions. For a given depth-time combination the required adjustment is determined almost entirely by its order in the sequence and the duration of its preceeding interdive interval; the tables use these factors rather than repetitive groups. A linear interpolation method is used to account for excursions that use less than the total allowable time. Author (ESA)

N86-19877 Copenhagen Univ. (Denmark).
EXCURSION LIMITS IN SHALLOW WATER HELIOX SATURATION DIVING
Joop Madsen *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 199-201 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Discrepancies between experimental results on which tables for unlimited duration excursions from shallow heliox saturation are calculated are noted. Reasons for the discrepancies, and their significance for diving safety are discussed. Discrepancies may be due to the differences between experiment designs, particularly populations tested. Author (ESA)

N86-19878 Duesseldorf Univ. (West Germany). Inst. fuer Biophysik und Elektronenmikroskopie.
WET CHAMBER DIVES TO TEST ALGORITHMS FOR ELECTRONIC DECOMPRESSIOMETERS
M. Hahn, P. Hampe (DFVLR, Cologne, West Germany), and S. John (Deutsche Lebensrettungsgesellschaft, Berlin, West Germany) *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 203-211 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Wet chamber dives, simulating nonrectangular profiles and repetitive diving common in sports-diving, were performed to test a decompression model and supersaturation tolerances used in an electronic decompressiometer. Ultrasonic Doppler bubble measurements were made during test-dives. Occurrence of type 1 decompression sickness and peculiarities in the bubble history suggest that denitrification is delayed by decompression stress. Author (ESA)

N86-19879 Saitama Univ., Urawa (Japan). Dept. of Hygiene.
AN APPRAISAL OF DIVE PROFILES IN SHELLFISH DIVERS WITH REFERENCE TO THE RISK OF DECOMPRESSION SICKNESS
Ichiro Nashimoto, Koh Kobayashi, and Yoshiyuki Gotoh *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 213-219 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The dive profiles of six helmet shellfish divers were recorded and venous gas emboli (VGE) of divers after surfacing were monitored. Theoretical tissue nitrogen pressure (TNP) and decompression thresholds (DTHs) were calculated. Dive depth was 16 to 36 m, bottom time 16 to 36 min, and total ascent time 16 to 29 min. The first decompression stop was usually taken at 20 m, the second at 10 to 5 m. Constant fluctuations in diving depth were seen at the bottom. At each decompression stop the diver moved up and down within a range of 2 to 6 m. Grade 2 VGE is detected among 3 divers after surfacing from the second dive. No DCS is observed. With few exceptions, their empirical decompression profiles do not exceed the DTHs. This may be related to the reduced risks of DCS. Author (ESA)

N86-19880 Royal Norwegian Navy, Haakonsvern. Bureau of Ships.
ALTERNATIVES TO STANDARD AIR TABLES
Arne-Johan Arntzen *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 221-228 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Diving companies used an empirically modified surface decompression table with nitrox. This combination gives very long bottom times compared to standard air tables. Experience from several thousand dives (salvage and construction) proves that bends frequency is satisfactory. Evaluation of 2662 dive reports shows that the procedures are safe enough to be recommended for official use, with minor modifications. Author (ESA)

N86-19881 Compagnie Maritime d'Expertises, Marseille (France).
THE INFLUENCE OF INDIVIDUAL FACTORS IN MAN ON BUBBLE FORMATION IN AIR DIVING DECOMPRESSION
M. Carlioz, M. Comet, and B. Gardette *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 229-239 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The influence of biometric factors on decompression was studied in 78 air dives of 78 male subjects at 24 m 90 min bottom time, 30 m 80 min, and 51 m 40 min. Results show that factors which influence individual susceptibility to eliminate gas as bubbles, and consequently to pathological risk, are age, weight, and fat tissue. The statistical results were extended to 133 unit air chamber dives. The correlation coefficients are: 0.45 for age, 0.32 for fat tissue, and 0.28 for weight. Thus, there is not a sole determining factor but it appears that the sum of these 3 factors (age + weight + fat tissue : $r = 0.52$) induces pathogenic bubble formation during decompression. Author (ESA)

N86-19882 Direction des Constructions et Armes Navales, Toulon (France). Centre d'Etudes et de Recherches Techniques Sous-Marines.
ULTRASONIC DETECTION OF CIRCULATING BUBBLES IN EWES EXPOSED TO SIMULATED DIVES DEEPER THAN 800 msw UNDER ISOBARIC CONDITIONS AND WITH UNCHANGED GAS MIXTURES
G. Masurel, J. Hee, L. Giacomoni, and R. Guillerm *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 241-246 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

As part of a study intended for the in vivo checking of blood gases in animals exposed to high pressures, ewes were exposed to simulated saturation dives with heliox under normoxic conditions at depths between 800 and 1000 msw. Circulating bubbles are

reported during the simulated dives and during stops at the bottom, although conditions were isobaric, and the gas mixture was not changed. Author (ESA)

N86-19883 Red Cross Hospital, Barcelona (Spain). Centre de Recuperacio i de Investigacions Submarines.
LESS BUBBLE FORMATION IN WOMEN DIVERS
Jordi Desola-Ala and Gerard Masurel *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 247-256 refs Prepared in cooperation with Direction des Constructions et Armes Navales, Toulon, France (For primary document see N86-19854 10-52)
Avail: Issuing Activity

Nine couples (1 man, 1 woman) performed identical dives at depths varying from 40 to 50 msw during enough time to produce a residual nitrogen coefficient L according to US Navy decompression tables. Circulating bubbles in the precardial region were determined immediately after the dive and every 30 min during 2.5 hr. Seven men produce detectable bubble degrees in at least one observation, while only three women do so. The men show a higher number of positive determinations and higher degrees of circulating bubbles. No correlation with individual or technical factors can be clearly signaled as responsible for these variations. It is suggested that women divers produce a less bubble degree than men, and their proneness to decompression sickness is related to other physiological factors. Author (ESA)

N86-19884 Japan Marine Science and Technology Center, Tokyo. Dept. of Undersea Science and Technology.
EFFECT OF LOW AND HIGH ENVIRONMENTAL TEMPERATURES ON DECOMPRESSION SICKNESS IN THE AGING RAT
Y. Taya, F. Shidara, Y. Mizyshima, M. Nakano, N. Naraki, K. Takao, and K. Seki *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine Aug. 1985 p 257-261 refs (For primary document see N86-19854 10-52)
Avail: Issuing Activity

The combined effects of aging and environmental temperature on decompression sickness incidence in male and female rats (10, 36, and 60 weeks old) in a compression chamber pressurized with air to 11 bar in 10 min were studied. Temperature was controlled at 20 and 30 C, and freely ventilated. Following a 40 min stop at 11 bar, the rats were decompressed in stages, and fatality ratio observed. The results demonstrate a significant relationship (at 0.01%) between aging and fatality ratio; fatality ratio increases under low environmental temperature compared to high environmental temperature. There is little gender effect on fatality.
Author (ESA)

N86-19885*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CUTTING HEAD FOR ULTRASONIC LITHOTRIPSY Patent Application
Earl D. Anguluo and Roger Goodfriend, inventors (to NASA) 30 Oct. 1985 10 p
(NASA-Case-GSC-12944-1; NAS 1.71:GSC-12944-1; US-Patent-Appl-SN-793006) Avail: NTIS HC A02/MF A01 CSCL 06E

A cutting head for attachment to the end of the wire probe of an ultrasonic kidney stone disintegration instrument is described. The cutting head has a plurality of circumferentially arranged teeth formed at one end thereof to provide a cup shaped receptacle for kidney stones encountered during the disintegration procedure. An integral reduced diameter collar diminishes stress points in the wire and reduce breakage thereof. NASA

N86-19886*# California State Coll., Bakersfield.
GENERAL AUTOMATIC COMPONENTS OF MOTION SICKNESS
Steven Suter, William B. Toscano, Joe Kamiya, and Karen Naifeh [1985] 37 p refs Prepared in cooperation with California Univ., San Francisco
(Contract NCC2-115)
(NASA-CR-176516; NAS 1.26:176516) Avail: NTIS HC A03/MF A01 CSCL 06S

A body of investigations performed in support of experiments aboard the space shuttle, and designed to counteract the symptoms of Space Adapatation Syndrome, which resemble those of motion sickness on Earth is reviewed. For these supporting studies, the automatic manifestations of earth-based motion sickness was examined. Heart rate, respiration rate, finger pulse volume and basal skin resistance were measured on 127 men and women before, during and after exposure to nauseogenic rotating chair tests. Significant changes in all autonomic responses were observed across the tests. Significant differences in autonomic responses among groups divided according to motion sickness susceptibility were also observed. Results suggest that the examination of autonomic responses as an objective indicator of motion sickness malaise is warranted and may contribute to the overall understanding of the syndrome on Earth and in Space.
Author

N86-19887# Massachusetts Univ., Amherst. Dept. of Psychology.
BIOLOGICAL INVESTIGATIONS OF ADAPTIVE NETWORKS. NEURONAL CONTROL OF CONDITIONED RESPONDING Annual Technical Repor, 30 Apr. 1984 - 20 May 1985
J. W. Moore 20 May 1985 26 p
(Grant AF-AFOSR-0215-83)
(AD-A160345; AFOSR-85-0746TR; ATR-2) Avail: NTIS HC A03/MF A01 CSCL 06/16

Neurobiological investigations of adaptive neural networks were conducted using the classically conditioned nictitating membrane response (NM CR) of rabbit, a widely used model system for studies of learning. One experimental approach involved recording from single brain neurons from awake, behaving animals for the purpose of determining the loci and characteristics of neurons with activity correlated with the NM CR or its inhibition. A second approach involved the use of discrete brain lesions that selectively eliminate the NM CR while at the same time sparing the basic reflex pathway. A third approach employed fiber-tracing anatomical techniques designed to clarify the inter-connectivity among brain regions essential for the NM CR. These regions include discrete portions of the cerebellum and brain stem. Information from physiological studies has been incorporated into mathematical models of learning used by adaptive network researchers, and anatomical findings have guided the development of related neuronal models. GRA

N86-19888# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STUDY OF PATIENT'S SELF-IMAGE DURING ORTHODONTIC TREATMENT M.S. Thesis
B. B. Jacobus, Jr. Jun. 1985 126 p
(AD-A160751; AFIT/CI/NR-85-117T) Avail: NTIS HC A07/MF A01 CSCL 05/10

There has been little research done that has attempted to study the patient's self-image and record what changes occur with a correction of the patient's malocclusion through orthodontic treatment. A study was done to determine what changes occur in the orthodontic patient's self-image during orthodontic treatment. A questionnaire requiring responses pertaining to self-image was distributed to three hundred sixty 11 to 19-year old patients in various phases of pre-treatment and retention. The data was collected and statistically analyzed. Variables of age, sex, and time in treatment were examined. Findings indicated a definite positive effect upon the orthodontic patient's self-image. Significant differences in response levels of different age groups, time in treatment groups and males and females were found. The effects on self-image were the largest during the first year of active treatment and remained at a higher level throughout treatment. The positive self-image levels continued through the retention phase of treatment. GRA

N86-19889# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
IN VITRO COMPARISON OF ZINC PHOSPHATE AND GLASS

IONOMERS ABILITY TO INHIBIT DECALCIFICATION UNDER AND ADJACENT TO ORTHODONTIC BANDS M.S. Thesis
D. J. Copenhaver Aug. 1985 60 p
(AD-A160881; AFIT/CI/NR-85-141T) Avail: NTIS HC A04/MF A01 CSCL 06/5

Forty sets of impacted third molar teeth were banded with custom fitted bands and cycled in a latic acid solution for four weeks. This solution simulates an environment that would be found only in patients with the worst oral hygiene. Each set was from the same patient. Visual, spectrophotometric and pH testing were done on the sample sets. All area not banded showed significant decalcification after four weeks in the 0.10 M latic acid solution. The teeth banded with glass ionomer cement showed significantly more calcium was present in solution in the zinc phosphate cemented sample solutions also confirmed were more Ca(++) ions in solution. The evidence suggest that glass ionomer cement protects the tooth surfaces from decalcification under and adjacent to orthodontic bands significantly better than zinc phosphate cements. Further study on solubility and setting time of this new glass ionomer cement is necessary before routine clinical use can be considered. Author (GRA)

N86-19890# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
PASSING SCORES FOR THE FAA ATCS COLOR VISION TEST
J. J. Convey Aug. 1985 19 p
(AD-A160889; DOT/FAA-AM-85-7) Avail: NTIS HC A02/MF A01 CSCL 06/16

In response to recommendations from the Office of Personnel Management for measures of normal color vision that reflects as closely as possible the functional color vision requirements for an air traffic controller (Christup, 1981), subtests which simulated ATC tasks were developed in three content areas: (1) aircraft colors for fuselage and lights, (2) color weather radar displays, and (3) navigational chart terrain elevations. Pickrel and Convey (1983) performed an item analysis on these subtests using data obtained from 41 persons with normal color vision as determined by their performance on the Pseudoisochromatic Plates Test (PIP) from the American Optical Corporation and 22 persons with defective color vision according to the PIP. The item parameters and the internal consistency reliability estimates obtained were satisfactory. GRA

N86-19891# Naval Health Research Center, San Diego, Calif.
ASSESSING THE HEALTH RISKS OF CARRIER LANDINGS IN US NAVY PILOTS Interim Report
Anne Hoiberg and Ralph G. Burr Jul. 1985 12 p
(AD-A160928; AD-F630624; NAVHLTHRSCHC-85-24) Avail: NTIS HC A02/MF A01 CSCL 01/2

Landing an airplane on an aircraft carrier is one of the most demanding and complex tasks required of Navy pilots. Heart rate values in pilots increase during flight, especially during landings and launch. Because of the hazards involved, carrier landings might have an impact on the health of Navy pilots. This study was designed to determine whether or not carrier landings adversely affected the health of Navy pilots. The objective was to compare the hospitalization and mortality rates of helicopter pilots and fixed-wing pilots who had considerable carrier landing experience with a control group of pilots who had little, if any, carrier landing experience. Results of comparisons across carrier landing exposure groups revealed no significantly higher total hospitalization rate of any one of the three groups. GRA

N86-19892# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
INVESTIGATION OF THE METHOD TO DETERMINE CARBOXY-HAEMOGLOBIN IN BLOOD
D. M. Kane Aug. 1985 66 p
(AD-A161061; DCIEM-85-R-32) Avail: NTIS HC A04/MF A01 CSCL 06/1

The current method for determining blood carboxyhemoglobin concentration by gaschromatography has been critically evaluated and compared to spectrophotometric analysis methods. The major sources of bias in the method accuracy have been found to be in the measurement of blood volume and in the separate determination of total hemoglobin concentration in the blood. The method is estimated to have a coefficient of variation of 6.2% over the range of 0.5 to 20 vol % COHb. Standardization procedures which have been examined are the use of a 500 ppm carbon monoxide in nitrogen gas mixture and carbon monoxide-saturated blood solutions as external standards. Also, methods of saturating blood with carbon monoxide have been examined, with the use of an impinger or tonometer held at 37 C giving the most effective results. Studies of long-term storage of carbon monoxide blood have been carried out and have revealed that the concentration remains stable for up to nine days if the blood is stored anaerobically at refrigerator temperatures. Blood containing 10% or less carboxyhemoglobin has been found to be stable up to 60 days. GRA

N86-19893# Naval Submarine Medical Research Lab., Groton, Conn.
BODY WEIGHT CHANGES BEFORE AND AFTER SUBMARINE PATROLS Interim Report
Kenneth R. Bondi and Arthur N. Beare 25 Sep. 1985 9 p
(AD-A161144; NSMRL-1062) Avail: NTIS HC A02/MF A01 CSCL 06/16

Analysis of pre- and post-patrol body weight of 670 men from the crews of seven submarines showed that 32% of the men gained weight, 52% lost, and the 12% did not change. From the magnitude of individual weight losses, it was inferred that as many as a third of the men may have been actively dieting. These data do not support the widespread belief that men tend to gain weight during submarine patrols. Author (GRA)

N86-19894# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ABSORPTION OF BENZENE THROUGH HUMAN SKIN
J. Hanke, T. Dutkiewicz, and J. Piotrowski 28 Oct. 1985 22 p
Transl. into ENGLISH from Medycyna Pracy (Poland), v. 12, no. 5, 1981 p 413-426
(AD-A161157; FTD-ID(RS)T-0395-85) Avail: NTIS HC A02/MF A01 CSCL 06/20

As a result of the proliferation of benzene solutions in several production technologies and of leading to prolonged exposure poisonings, the question of absorption through the skin has re-emerged with respect to the direction of preventive measures and the necessity to clarify the observed clinical signs of absorption. The absorption of benzene through the skin in men in experimental conditions was examined. The liquid benzene was absorbed with the velocity about 0,4 mg/sq cm/hour; the absorption of the benzene vapors was insignificant and it did not exceed 1 per cent of that absorbed throughout the respiratory ways in the same conditions. The study was based on the determination of phenol contents in urine and on the new direct chemical method for the designation of skin absorption of benzene, this method was described in the paper. The authors concluded that the absorption of benzene through the skin must not be neglected. GRA

N86-19895# Naval Postgraduate School, Monterey, Calif.
EXAMINATION OF RETINAL PATTERN THRESHOLD LEVELS AND THEIR POSSIBLE EFFECT ON COMPUTER ACCESS CONTROL MECHANISMS M.S. Thesis
Debra K. Helle Sep. 1985 48 p
(AD-A161213) Avail: NTIS HC A03/MF A01 CSCL 06/2

The advent of multi-programming and the proliferation of shared computer systems has increased the need for greater computer security. Computer security can be segmented into six categories: physical, hardware, software, personnel, communications and procedures. Embedded into software security are those features which protect the system against both unauthorized access and denial of service of authorized users. Another term for this is access control. Access control mechanisms verify an individual's identity via three distinct methods: (1) something an individual knows, (2) something an individual possesses or (3) something about the individual. One device which keys on something about

the individual is a retinal scan system. This system utilizes the retinal blood vessel pattern as a unique identifier. This thesis studies one such retinal pattern recognition device. For the purposes of this study, an experiment was designed and conducted which determined the reliability of this system as a function of various tolerance levels, as well as its applicability as a computer systems access control mechanism. The Eye Dentify 7.5 system proved to be a fairly expensive, highly reliable access control device. Its probability for false recognitions is far better than most other known devices. It can be used as a physical access device at virtually any military installation where access devices are used. GRA

N86-19832# Joint Publications Research Service, Arlington, Va.
FLUORESCENT-POLARIZATION PROPERTIES OF CHROMOPHORES OF WATER-SOLUBLE PROTEINS OF NORMAL AND CATARACTAL HUMAN LENS
T. V. Birich, N. I. Poznyak, N. A. Prokoshina, and S. N. Cherenkevich *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 21-24 refs Transl. into ENGLISH from Doklady Akademii Nauk BSSR (Minsk, USSR), v. 29, no. 8, Aug. 1985 p 757-759 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19833# Joint Publications Research Service, Arlington, Va.
ELEMENT ANALYSIS OF SCLEROTIC FORMATIONS OF MAJOR BLOOD VESSELS BY LASER MASS SPECTROMETRY Abstract Only
G. G. Arabidze, S. M. Burkitbayev, Yu. A. Bykovskiy, A. I. Kutsenko, I. D. Laptev, E. A. Manykin, Ye. A. Petrenko, and V. T. Timoshin *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 29 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 655-660 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19834# Joint Publications Research Service, Arlington, Va.
CLINICO-EPIDEMIOLOGICAL CHARACTERISTICS OF Q FEVER IN CARPATHIAN FOOTHILLS
A. A. Sukhopyatkina, O. S. Bat, A. V. Levitskaya, and V. G. Potapova *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 34-36 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, April 1985 p 80-81 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19835# Joint Publications Research Service, Arlington, Va.
EPIDEMIOLOGICAL SUPERVISION OF POLIOMYELITIS
Yu. I. Vaserin, L. V. Vaserin, R. G. Vlasova, R. G. Balakireva, S. F. Zakirova, N. V. Patsuk, and N. Ya. Venediktova *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 37-42 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 81-85 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19837# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF REACTOGENIC AND ANTIGENIC ACTIVITY OF CHROMATOGRAPHICALLY PURIFIED, CONCENTRATED AND INACTIVATED DRY VACCINE AGAINST TICK BORNE ENCEPHALITIS Abstract Only
O. V. Popov, A. A. Sumarokov, R. Ya. Shkolnik, L. B. Elbert, M. S. Vorobyeva, G. L. Krutyanskaya, A. V. Razgulyayeva, and M. N. Rasshchepkina *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 51-52 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 6, Jun. 1985 p 34-39 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19840# Joint Publications Research Service, Arlington, Va.
EXHIBITS CONCERNING SPARING MEDICINE AT ZDRAVOOKHRANENIYE-85 AT MOSCOW Abstract Only
Ye. Ponarina *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 59-60 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 3 Aug. 1985 p 4 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19841# Joint Publications Research Service, Arlington, Va.
MAGNETS AND SURGICAL PROCEDURES
V. Sarelyev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 62-63 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 23 Aug. 1985 p 3 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19843# Joint Publications Research Service, Arlington, Va.
THERMOVISUAL INDICATORS OF BRAIN RESPONSE TO VISUAL STIMULI Abstract Only
I. A. Shevelev, Ye. N. Tsykalov, A. M. Gorbach, K. P. Budko, and G. A. Sharayev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 75 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 538-543 Original language document was announced in IAA as A86-10695 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19844# Joint Publications Research Service, Arlington, Va.
NEURONAL RESPONSE AND EVOKED POTENTIALS IN SUBCORTICAL FORMATIONS IN VISUAL PERCEPTION. PART 1: PROBLEM FORMULATION AND PRINCIPLES OF SOLUTION Abstract Only
Yu. D. Kropotov and V. A. Ponomarev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 75-76 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 563-575 Original language document was announced in IAA as A86-10696 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19845# Joint Publications Research Service, Arlington, Va.
RESPIRATORY FUNCTION IN INHABITANTS OF NORTH-EASTERN USSR Abstract Only
L. N. Matveyev, A. G. Marachev, A. N. Kozin, S. A. Kharkov, and I. Z. Sheres *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 77-78 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 634-640 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19846# Joint Publications Research Service, Arlington, Va.
EFFECTS OF 24 h SLEEP DEPRIVATION ON BIOGENIC AMINE METABOLISM Abstract Only
T. D. Bolshskova, S. A. Meshcheryakova, V. F. Tyabenkova, N. I. Romanova, Ya. I. Levin, and I. G. Dallakyan *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 78-79 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 652-656 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19847# Joint Publications Research Service, Arlington, Va.
VISUAL FORM PERCEPTION FROM HALFTONE IMAGES Abstract Only
A. M. Kuperman and A. B. Kravtsov *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 79 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 687-689 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19848# Joint Publications Research Service, Arlington, Va.
PROBLEM OF BIOLOGICAL CLOCKS: NEW DATA ON CIRCADIAN CHANGES IN STATUS OF HUMAN ORGANISM Abstract Only
L. Ya. Glybin *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 80 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 717-720 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19849# Joint Publications Research Service, Arlington, Va.
ENHANCEMENT OF SOMNIFEROUS EFFECTS OF THERMAL PULSATION BY SIMULTANEOUS APPLICATION TO TWO REFLEXOGENIC ZONES Abstract Only
V. A. Likhtenshteyn and T. M. Mugutdinov *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (PRS-UBB-86-001) 2 Jan. 1986 p 80 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 689-691 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N86-19896# Naval Aerospace Medical Research Lab., Pensacola, Fla.
SIMPLE AND CHOICE REACTION TIME IN A SECONDARY TASK UNDER VARIED STIMULUS MODALITY PROBABILITIES Interim Report
D. K. McBride, L. S. Goodman, and J. M. Owens Feb. 1985 12 p
(AD-A159698; NAMRL-1313) Avail: NTIS HC A02/MF A01 CSCL 05/10

Most investigations of attention and attention allocation have been limited to assessments of attention shifting among stimuli simultaneously presented within a single sensory modality. The construct of attention, however, is generally conceptualized as the process which determines the selection of sensory information from all potential sources, among all potential modalities. Although limited in relevance to more real-world, high demand task situations, many of the findings and interpretations from single modality attention studies provide an important theoretical basis for performance assessment in complex task environments requiring multimodal processing. The objective of the present research was to directly assess attention allocation in tasks requiring both visual and auditory information processing. In the present study, modality uncertainty was reduced by experimentally manipulating the probability of stimulus occurrence within a given modality. Furthermore, responding in the present experiment required choice as well as simple reaction, and the responses were made jointly with the continuous execution of a three-axis, compensatory tracking task. As expected, simple and choice reaction times to auditory signals were faster than were those to visual signals. GRA

N86-19897# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EVALUATION OF A MULTI-METHOD GROUP TREATMENT APPROACH FOR THE MANAGEMENT OF STRESS Ph.D. Thesis
S. H. Tallant 1985 322 p
(AD-A160813; AFIT/CI/NR-85-118D) Avail: NTIS HC A14/MF A01 CSCL 05/10

The treatment effectiveness of a stress management package is evaluated. The role of social support as a significant external factor in reducing stress symptomatology is then discussed. It is hypothesized that subjects receiving treatment would obtain significantly greater decreases in stress than subjects in a waiting list condition. Also, it is hypothesized that wait-list subjects with high levels of social support would obtain significant greater decreases in stress than wait-list subjects with low levels of social support. A matched-pair randomized block design is used. Thirty-two subjects are rank ordered on a measure of social support, matched according to level of social support, and randomized into either treatment or wait-list condition. The statistical and clinical results demonstrate the contribution of the stress management package in reducing stress when compared to no treatment intervention. GRA

N86-19898# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN INVESTIGATION INTO PEER AND SUPERVISOR DIFFERENCES IN THE OBSERVATION OF PERFORMANCE-RELATED BEHAVIORS M.S. Thesis
M. W. Daley Dec. 1985 46 p
(AD-A160819; AFIT/CI/NR-85-132T) Avail: NTIS HC A03/MF A01 CSCL 05/9

Differences between peer and supervisors with respect to the observation of performance-related behaviors using the Instanteneous Report of Judgments (IRJ) technique are examined. Undergraduate students and graduate teaching assistants served as peer and supervisor subjects respectively. All subjects viewed a videotape of an undergraduate giving a major classroom oral presentation. It was hypothesized that peer and supervisor subjects would differentially observe imbedded incidents due to their different role relationships to the presenter. The results indicate partial support for the hypothesis, with supervisor subjects observing significantly more critical incidents. An alternative interpretation for the results, that of rater expertise, is forwarded and discussed. Directions for future research in the area of cognitive processes and performance appraisal are discussed. GRA

N86-19899# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE CLINICAL PREDICTION OF DANGEROUSNESS Ph.D. Thesis
E. R. Williams May 1985 119 p
(AD-A160820; AFIT/CI/NR-85-133D) Avail: NTIS HC A06/MF A01 CSCL 05/10

The failure to accurately predict violent potential in psychiatric patients is currently an area of popular and professional interest. Virtually all studies have shown psychological testing to be a poor predictor of violence. The present investigation utilized typed vignettes which described a brief, fictionalized interview as an analog to an actual contact with a patient. A recent history of violence (an actuarial factor), support by a caring person (an environmental factor), and psychological testing information were systematically manipulated among the vignettes. Vignettes were mailed to psychiatrists in California who are asked to rate dangerousness and to decide if emergency hospitalization was required for the fictionalized patient. Each psychiatrist received one of 16 possible vignettes. Statistical analyses were utilized to determine how the three manipulated variables actually influenced professional decision making, and these results were compared with what factors the psychiatrists said influenced them. Psychological testing exerts a powerful but unwarranted, and possible unconscious, influence on the judgmental process. GRA

N86-19900# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MESOLIMBIC AND NIGROSTRIATAL DOPAMINERGIC SYSTEMS: BEHAVIORAL NEUROPHARMACOLOGY Ph.D. Thesis
S. L. Hartgraves Aug. 1985 150 p
(AD-A160821; AFIT/CI/NR-85-134D) Avail: NTIS HC A07/MF A01 CSCL 06/15

Drug-induced behaviors associated with the nucleus acumbens and striatum are examined. The use of 6-Hydroxydopamine to anatomically enhance a behavior emanating from one of the above structures (by allowing doses of drugs low enough to prevent major behavioral competition from the other) was only partially successful. Thus, locomotor hyperactivity and circling were enhanced by 6-OHDA-induced lesions of the nucleus accumbens and the medial forebrain bundle, respectively. Bilateral lesions of the striatum did not result in simple enhancement of stereotypic

behavior, but instead caused a unique, self-directed behavior termed stereotypic grooming. Competition between the nucleus accumbens and the striatum for behavioral expression was evident in most of these studies. GRA

N86-19901# Chicago Univ., Ill. Center for Decision Research.
A MODEL OF THE CONJUNCTION FALLACY
H. J. Einhorn Jun. 1985 26 p
(Contract N00014-84-C-0018)
(AD-A160876; TR-15) Avail: NTIS HC A03/MF A01 CSCL 05/10

Tversky & Kahneman show that both sophisticated and naive people, in many different substantive problems, often judge the conjunction of events to be larger than one of its components (hereafter called a single violation). Furthermore, for some problems, people judge the conjunction as larger than both of its components (a double violation). The purpose of this document is to propose a quantitative model of how people judge the probability of conjunctive events. The advantage of the model is that it makes specific predictions as to when conjunction fallacies of different types will or will not occur. Moreover, the model is naturally extended to deal with conjunctive explanations for events. The conjunction fallacy occurs when the judged probability of a conjunctive event is larger than the probability of one (or more) of its constituents. A model of this phenomenon is proposed in which the judged conjunctive probability is a weighted geometric average of the component probabilities, where the weights reflect the representativeness of the components. The model generalizes to the case where the events involve a casual or correlational link, and, to the use of conjunctive explanations of an event. In all three situations, the model specifies the conditions under which different degrees of the fallacy will or will not occur. GRA

N86-19902# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ON THE ANALYSIS AND DESIGN OF HUMAN INFORMATION PROCESSING ORGANIZATIONS
Kevin L. Boettcher and Robert R. Tenney Oct. 1985 6 p
(Contracts N00014-77-C-0532; N00014-84-K-0519)
(AD-A161015; AD-F620003; LIDS-P-1503) Avail: NTIS HC A02/MF A01 CSCL 05/10

The design of human organizations where members perform routine tasks under the pressure of time is considered. A three-phase approach is outlined. In the first phase, normative decision rules that specify ideal human behavior are obtained. In the second phase, implementations of these decision rules are devised, and descriptions of actual human behavior and workload are developed. Finally a third phase integrates design elements by placing parameters of the implementations for best organization performance, subject to individual member workload limitations. To illustrate the approach, a specific design problem is considered. Author (GRA)

N86-19903# Essex Corp., Orlando, Fla.
AN ANALYSIS OF VISUAL TASKS IN HELICOPTER SHIPBOARD LANDING Final Technical Report, Sep. 1981 - Apr. 1985
K. S. Berbaum and R. S. Kennedy 1 Nov. 1985 62 p
(Contract N61339-81-C-0105)
(AD-A161101; EOTR-85-7) Avail: NTIS HC A04/MF A01 CSCL 05/8

The purpose of this research effort was to identify visual research issues concerning helicopter landings, particularly the hover phase, for future study in the Visual Technology Research Simulator (VTRS) program. Identification of salient visual issues is a step toward surfacing equipment features that can be modified and studied. As we discussed the task with pilots, reviewed NATOPS manuals, and simulations witnessed, it became apparent that the visual task may differ depending upon whether: experienced or inexperienced pilots are flying; a simulator or an aircraft is flown; the environment is day or night; the pilot sought to acquire or maintain a skill level. As a way of limiting this broad project, it was elected to review intensively a scenario involving a highly experienced operator flying dusk/night approaches in a simulator. The Naval aviator selected was prompted by another aviator more familiar with the objective who dictated verbal protocols of his visual and control activities during several landings. These protocols were sorted into 10 phases in order to correspond to increasing distances in the landing task and the visual information processing within each stage was described. Therefore, the stages are delimited in terms of range or altitude from the ship. We believe the most useful outcome of this analysis will be a list of visual cue augmentations that may be implemented and studied over the various stages of landing. GRA

N86-19904# Brown Univ., Providence, R. I. Center for Neural Science.
LOCAL AND GLOBAL FACTORS IN LEARNING
Leon N. Cooper 6 Nov. 1985 42 p
(AD-A161128; TR-28) Avail: NTIS HC A03/MF A01 CSCL 05/10

Recent progress in the interaction of theoretical ideas and experimental results that relate to learning and memory is discussed. Consideration is given, in particular, to the effects of the neurotransmitters GABA, Norepinephrine and Acetylcholine on the development of circuitry in visual cortex. That most intriguing aspect of human memory is that: its persistence in spite of continual loss of individual neurons over the lifetime of the individual has led many workers to the concept of distributed memory. For a distributed memory (more like a hologram than a photograph) possesses in a very natural way the property of relative invulnerability to the loss of storage units. Individual memory sites hold superimposed information concerning many events. We can make complex decisions in small parts of a second. This suggests very strongly that there is much parallel processing in the brain - an idea that is almost obvious on inspection of component such as the retina. It is now commonly thought that the synaptic junction may be a means to store information (memory, for example) as well as to transmit it from neuron to neuron. GRA

N86-19905# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
THE INFLUENCE OF QUALITY CIRCLES ON ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL M.S. Thesis
Alfred E. Thal, Jr. Sep. 1985 29 p
(AD-A161152; AFIT/GEM/LSB/85S-21) Avail: NTIS HC A03/MF A01 CSCL 13/2

This thesis investigated the influence of QCs on various satisfaction levels among Air Force civil engineering personnel with the objective being to determine whether a relationship exists between QC membership and an employee's level of satisfaction/morale. Surveys were mailed to a sample of QC members and nonmembers working in civil engineering squadrons at five different bases. Statistical analysis consisted of reliability estimation, Pearson correlation, and Student's t-tests. The results of this research indicated that there were significant differences between QC members and nonmembers on two variables: self-ratings of both job performance and job effort. In fact, it appeared that QC members scored lower, but not significantly lower, on many of the variables. The many weaknesses inherent in this study suggest that these results are tentative, at best. Four tenable explanations for the results are given. If QCs are to be increasingly used by the government, further research into the outcomes of the QC process are warranted. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N86-19906*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS:

CELSS 1985 WORKSHOP
Robert D. MacElroy, ed., Norman V. Martello, ed., and David T. Smernoff, ed. Jan. 1986 624 p refs Workshop held at Moffett Field, Calif., 16-19 Jul. 1985
(NASA-TM-88215; A-86132; NAS 1.15:88215) Avail: NTIS HC A99/MF A01 CSCL 06K

Various topics related to closed ecological systems are discussed. Space habitats, vegetative growth, photosynthesis, recycling, culture techniques, waste utilization bioreactors and controlled atmospheres on space stations are among the topics covered. For individual titles, see N86-19907 through N86-19943.

N86-19907*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Sciences.
POTENTIAL FOR UTILIZATION OF ALGAL BIOMASS FOR COMPONENTS OF THE DIET IN CELSS
A. R. Kamarei, Z. Nakhost, and M. Karel *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 13-22 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell Density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances is potential nutritional and organoleptic acceptability as a diet component in controlled Ecological Life Support System. Author

N86-19908*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
BLSS, A EUROPEAN APPROACH TO CELSS
A. Ingemar Skoog *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 23-33 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Several studies have revealed the benefits of a biological life support system (BLSS) in space stations. Problem areas requiring experimental and analytical investigations necessary for the development of BLSS have been identified. The nature of these problems allows for the classification into near-term (prepilot) and long-term (pilot) studies, and into terrestrial and space research programmes. The knowledge of planned European and U.S. space experiments allows for a coordination with existing Spacelab and Shuttle programmes to avoid duplication of research efforts. The Japanese also plan biological experiments on Spacelab in 1988. Coordinating efforts should provide answers to certain BLSS relevant questions. Major areas which need immediate attention are: micorgravity effects; cosmic radiation effects; use of PAR-radiation and high energy particle radiation protection; and monitoring and control (including sensor technology). R.J.F.

N86-19909*# National Aerospace Lab., Tokyo (Japan).
CELSS EXPERIMENT MODEL AND DESIGN CONCEPT OF GAS RECYCLE SYSTEM
Keiji Nitta, Mitsuo Oguchi, and Syuji Kanda (Kawasaki Heavy Industries Ltd., Kobe, Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 35-46 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

In order to prolong the duration of manned missions around the Earth and to expand the human existing region from the Earth to other planets such as a Lunar Base or a manned Mars flight mission, the controlled ecological life support system (CELSS) becomes an essential factor of the future technology to be developed through utilization of space station. The preliminary system engineering and integration efforts regarding CELSS have been carried out by the Japanese CELSS concept study group for clarifying the feasibility of hardware development for Space station experiments and for getting the time phased mission sets after FY 1992. The results of these studies are briefly summarized and the design and utilization methods of a Gas Recycle System for CELSS experiments are discussed. Author

N86-19910*# Yokohama National Univ. (Japan). Dept. of Chemical Engineering.
UTILIZATION OF MEMBRANES FOR H2O RECYCLE SYSTEM
Haruhiko Ohya and Mitsuo Oguchi (National Aerospace Lab., Tokyo, Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 47-53 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Conceptual studies of closed ecological life support systems (CELSS) carried out at NAL in Japan for a water recycle system using membranes are reviewed. The system will treat water from shower room, urine, impure condensation from gas recycle system, and so on. The H2O recycle system is composed of prefilter, ultrafiltration membrane, reverse osmosis membrane, and distillator. Some results are shown for a bullet train of toilet-flushing water recycle equipment with an ultraviltration membrane module. The constant value of the permeation rate with a 4.7 square meters of module is about 70 1/h after 500th of operation. Thermovaporization with porous polytetrafluorocarbon membrane is also proposed to replce the distillator. Author

N86-19911*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
THE C23A SYSTEM, AN EXMAPLE OF QUANTITATIVE CONTROL OF PLANT GROWTH ASSOCIATED WITH A DATA BASE
Marcel Andre, Alain Daguenet, Daniel Massimino, and Alain Gerbaud *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 55-64 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The architecture of the C23A (Chambers de Culture Automatique en Atmosphere Artificielles) system for the controlled study of plant physiology is described. A modular plant growth chambers and associated instruments (I.R. CO2 analyser, Mass spectrometer and Chemical analyser); network of frontal processors controlling this apparatus; a central computer for the periodic control and the multiplex work of processors; and a network of terminal computers able to ask the data base for data processing and modeling are discussed. Examples of present results are given. A growth curve analysis study of CO2 and O2 gas exchanges of shoots and roots, and daily evolution of algal photosynthesis and of the pools of dissolved CO2 in sea water are discussed. R.J.F.

N86-19912*# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Raumfahrttechnik G.m.b.H.
DESCRIPTION OF CONCEPT AND FIRST FEASIBILITY TEST RESULTS OF A LIFE SUPPORT SUBSYSTEM OF THE BOTANY FACILITY BASED ON WATER RECLAMATION
Helmut R. Loeser *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 65-76 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The Botany Facility allows the growth of higher plants and fungi over a period of 6 months maximum. It is a payload planned for the second flight of the Eureca platform around 1990. Major tasks of the Life Support Subsystem (LSS) of the Botany Facility include the control of the pressure and composition of the atmosphere within the plant/fungi growth chambers, control of the temperature and humidity of the air and the regulation of the soil water content within specified limits. Previous studies have shown that various LSS concepts are feasible ranging from heavy, simple and cheap to light, complex and expensive solutions. A summary of those concepts is given. A new approach to accomplish control of the temperature and humidity of the air within the growth chambers based on water reclamation is discussed. This reclamation is achieved by condensation with a heat pump and capillary transport of the condensate back into the soil of the individual growth chamber. Some analytical estimates are given in order to

obtain guidelines for circulation flow rates and to determine the specific power consumption. R.J.F.

N86-19913*# Niigata Univ. (Japan). Dept. of Civil Engineering.
WET-OXIDATION WASTE MANAGEMENT SYSTEM FOR CELSS c25
Yukio Takahashi and Haruhiko Ohya (Yokohama National Univ., Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 77-84 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 07B

A wet oxidation system will be useful in the Closed Ecological Life Support System (CELSS) as a facility to treat organic wastes and to redistribute inorganic compounds and elements. However at rather higher temperatures needed in this reaction, for instance, at 260 deg C, only 80% of organic in a raw material can be oxidized, and 20% of it will remain in the liquid mainly as acetic acid, which is virtually noncombustible. Furthermore, nitrogen is transformed to ammonium ions which normally cannot be absorbed by plants. To resolve these problems, it becomes necessary to use catalysts. Noble metals such as Ru, Rh and so on have proved to be partially effective as these catalysts. That is, oxidation does not occur completely, and the unexpected denitrification, instead of the expected nitrification, occurs. So, it is essential to develop the catalysts which are able to realize the complete oxidation and the nitrification. Author

N86-19914*# North Carolina State Univ., Raleigh. Dept. of Soil Science.
SIMULATION MODEL FOR PLANT GROWTH IN CONTROLLED ENVIRONMENT SYSTEMS
C. David Raper, Jr. and Mien Wann *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 85-101 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The role of the mathematical model is to relate the individual processes to environmental conditions and the behavior of the whole plant. Using the controlled-environment facilities of the phytotron at North Carolina State University for experimentation at the whole-plant level and methods for handling complex models, researchers developed a plant growth model io describe the relationships between hierarchial levels of the crop production system. The fundamental processes that are considered are: (1) interception of photosynthetically active radiation by leaves, (2) absorption of photosynthetically active radiation, (3) photosynthetic transformation of absorbed radiation into chemical energy of carbon bonding in solube carbohydrates in the leaves, (4) translocation between carbohydrate pools in leaves, stems, and roots, (5) flow of energy from carbohydrate pools for respiration, (6) flow from carbohydrate pools for growth, and (7) aging of tissues. These processes are described at the level of organ structure and of elementary function processes. The driving variables of incident photosynthetically active radiation and ambient temperature as inputs pertain to characterization at the whole-plant level. The output of the model is accumulated dry matter partitioned among leaves, stems, and roots; thus, the elementary processes clearly operate under the constraints of the plant structure which is itself the output of the model. R.J.F.

N86-19915*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLAN FOR CELSS TEST BED PROJECT
William M. Knott *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 109-118 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The Closed Ecological Life Support Systems (CELSS) testbed project will achieve two major goals: It will develop the knowledge and technology needed to build and test biological or combined biological physiochemical regenerative life support systems. It will fabricate, test, and operate ground based facilities to accomplish proof-of-concent testing and evaluation leading to flight experimentation. The project will combine basic research and applied research/engineering to achieve a phased, integrated development of hardware, systems, and techniques for food and oxygen production, food processing, and waste processing in closed systems. The project will design, fabricate, and operate within three years a botanical production system scaled to a sufficient size to verify oxygen and nutrient load production (carbohydrates, fats, proteins) at a useable level. It will develop within five years a waste management system compatible with the botanical production system and a food processing system that converts available biomass into edible products. It will design, construct, and operate within ten years a ground based candidate CELSS that includes man as an active participant in the system. It will design a flight CELSS module within twelve years and construct and conduct initial flight tests within fifteen years. R.J.F.

N86-19916*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANT GROWTH CHAMBER M DESIGN
Ralph P. Prince and William M. Knott *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 119-128 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Crop production is just one of the many processes involved in establishing long term survival of man in space. The benefits of integrating higher plants into the overall plan was recognized early by NASA through the Closed Ecological Life Support System (CELSS) program. The first step is to design, construct, and operate a sealed (gas, liquid, and solid) plant growth chamber. A 3.6 m diameter by 6.7 m high closed cylinder (previously used as a hypobaric vessel during the Mercury program) is being modified for this purpose. The chamber is mounted on legs with the central axis vertical. Entrance to the chamber is through an airlock. This chamber will be devoted entirely to higher plant experimentation. Any waste treatment, food processing or product storage studies will be carried on outside of this chamber. Its primary purpose is to provide input and output data on solids, liquids, and gases for single crop species and multiple species production using different nutrient delivery systems. R.J.F.

N86-19917*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
OPERATIONAL DEVELOPMENT OF SMALL PLANT GROWTH SYSTEMS
H. W. Scheld (PhytoResource Research, Inc., College Station, Tex.), J. W. Magnuson (PhytoResource Research, Inc., College Station, Tex.), and R. L. Sauer *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 129-150 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The results of a study undertaken on the first phase of an empricial effort in the development of small plant growth chambers for production of salad type vegetables on space shuttle or space station are discussed. The overall effort is visualized as providing the underpinning of practical experience in handling of plant systems in space which will provide major support for future efforts in planning, design, and construction of plant-based (phytomechanical) systems for support of human habitation in space. The assumptions underlying the effort hold that large scale phytomechanical habitability support systems for future space stations must evolve from the simple to the complex. The highly complex final systems will be developed from the accumulated experience and data gathered from repetitive tests and trials of fragments or subsystems of the whole in an operational mode. These developing system components will, meanwhile, serve a useful operational function in providing psychological support and diversion for the crews. R.J.F.

N86-19918*# New Hampshire Univ., Durham. Complex Systems Research Center.
ELECTROCHEMICAL CONTROL OF pH IN A HYDROPONIC NUTRIENT SOLUTION
Steven H. Schwartzkopf *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 151-158

refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The electrochemical pH control system described was found to provide a feasible alternative method of controlling nutrient solution pH for CELSS applications. The plants grown in nutrient solution in which the pH was controlled electrochemically showed no adverse effects. Further research into the design of a larger capacity electrode bridge for better control is indicated by the results of this experiment, and is currently under way. Author

N86-19919*# Battelle Columbus Labs., Ohio.
AN ENGINEERING ANALYSIS OF A CLOSED CYCLE PLANT GROWTH MODULE
George H. Stickford, Jr., Frank E. Jakob, and D. Karl Landstrom *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 159-181 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The SOLGEM model is a numerical engineering model which solves the flow and energy balance equations for the air flowing through a growing environment, assuming quasi-steady state conditions within the system. SOLGEM provides a dynamic simulation of the controlled environment system in that the temperature and flow conditions of the growing environment are estimated on an hourly basis in response to the weather data and the plant growth parameters. The flow energy balance considers the incident solar flux; incoming air temperature, humidity, and flow rate; heat exchange with the roof and floor; and heat and moisture exchange with the plants. A plant transpiration subroutine was developed based plant growth research facility, intended for the study of bioregenerative life support theories. The results of a performance analysis of the plant growth module are given. The estimated energy requirements of the module components and the total energy are given. R.J.F.

N86-19920*# National Aerospace Lab., Tokyo (Japan).
GAS AND WATER RECYCLING SYSTEM FOR IOC VIVARIUM EXPERIMENTS
Keiji Nitta and Koji Otsubo *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 185-200 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Water and gas recycling units designed as one of the common experiment support system for the life science experiment facilities used in the Japanese Experiment Module are discussed. These units will save transportation and operation costs for the life science experiments in the space station. These units are also designed to have interfaces so simple that the connection to another life science experiment facilities such as the Research Animal Holding Facility developed by the Rockheed Missiles and Space Company can be easily done with small modification. R.J.F.

N86-19921*# National Aerospace Lab., Tokyo (Japan).
WATER RECYCLING SYSTEM USING THERMOPERVAPORATION METHOD
Keiji Nitta, Akira Ashida (Hitachi Ltd., Tokyo, Japan), Kenji Mitani (Hitachi Ltd., Tokyo, Japan), Katsuya Ebara (Hitachi Ltd., Tokyo, Japan), and Akira Yamada *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 201-225 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

A water recycling system concept for the crew of the space station is presented. A thermopervaporation method is a new key technology used for the distillation process, utilizing a hydrophobic membrane. An experimental study of thermopervaporation revealed that the permeation depends on the gap between the membrane and the cooling surface in the condensation room: the steam diffusion occurs with gaps less than 5 mm while natural convection becomes dominant with gaps more than 5 mm. A brief discussion of the system operation is also described. Author

N86-19922*# MODEC, Cambridge, Mass.
SUPERCRITICAL WASTE OXIDATION OF AQUEOUS WASTES
Michael Modell *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 227-251 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 07B

For aqueous wastes containing 1 to 20 wt% organics, supercritical water oxidation is less costly than controlled incineration or activated carbon treatment and far more efficient than wet oxidation. Above the critical temperature (374 C) and pressure (218 atm) of water, organic materials and gases are completely miscible with water. In supercritical water oxidation, organics, air and water are brought together in a mixture at 250 atm and temperatures above 400 C. Organic oxidation is initiated spontaneously at these conditions. The heat of combustion is released within the fluid and results in a rise in temperature 600 to 650 C. Under these conditions, organics are destroyed rapidly with efficiencies in excess of 99.999%. Heteroatoms are oxidized to acids, which can be precipitated out as salts by adding a base to the feed. Examples are given for process configurations to treat aqueous wastes with 10 and 2 wt% organics. Author

N86-19923*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRBORNE TRACE CONTAMINANTS OF POSSIBLE INTEREST IN CELSS
John S. Garavelli *In its* Controlled Ecological Life Support Systems Jan. 1986 p 253-262 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

One design goal of Closed Ecological Life Support Systems (CELSS) for long duration space missions is to maintain an atmosphere which is healthy for all the desirable biological species and not deleterious to any of the mechanical components in that atmosphere. CELESS design must take into account the interactions of at least six major components; (1) humans and animals, (2) higher plants, (3) microalgae, (4) bacteria and fungi, (5) the waste processing system, and (6) other mechanical systems. Each of these major components can be both a source and a target of airborne trace contaminants in a CELSS. A range of possible airborne trace contaminants is discussed within a chemical classification scheme. These contaminants are analyzed with respect to their probable sources among the six major components and their potential effects on those components. Data on airborne chemical contaminants detected in shuttle missions is presented along with this analysis. The observed concentrations of several classes of compounds, including hydrocarbons, halocarbons, halosilanes, amines and nitrogen oxides, are considered with respect to the problems which they present to CELSS. Author

N86-19924*# New Hampshire Univ., Durham. Complex Systems Research Center.
OBSERVATIONS ON GAS EXCHANGE AND ELEMENT RECYCLE WITHIN A GAS-CLOSED ALGAL-MOUSE SYSTEM
David T. Smernoff, Robert A. Wharton, Jr., and Maurice M. Averner *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 263-280 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Life support systems based on bioregeneration rely on the control and manipulation of organisms. Algae are potentially useful for a variety of Closed Ecological Life Support System (CELSS) functions including the revitalization of atmospheres, production of food and for nitrogen fixation. The results of experiments conducted with a gas-closed algal-mouse system designed to investigate gas exchange phenomena under varying algal environmental conditions, and the ability of algae to utilize oxidized mouse solid waste are reported. Inherent instabilities exist between the uptake and release of carbon dioxide (CO2) and oxygen (O2) by the mouse and algae in a gas-closed system. Variations in light intensity and cell density alter the photosynthetic rate of the algae and enable short-term steady-state concentrations of atmospheric CO2 and O2. Different nitrogen sources (urea and nitrate) result in different algal assimilatory quotients (AQ). Combinations of photosynthetic rate and AQ ratio manipulations were examined

for their potential in stabilizing atmospheric gas concentrations in the gas-closed algal-mouse system. R.J.F.

N86-19925*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CELSS SCIENCE NEEDS
John D. Rummel *In its* Controlled Ecological Life Support Systems Jan. 1986 p 281-284 (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Questions and areas of study that need to be persued in order to develope a Controlled Ecological Life Support System are posed. Research topics needing attention are grouped under various leadings: ecology, genetics, plant pathology, cybernetics, chemistry, computer science, fluid dynamics, optics, and solid-state physics. R.J.F.

N86-19926*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESIGN CONCEPTS FOR BIOREACTORS IN SPACE
P. K. Seshan, G. R. Peterson, B. Beard (Washington Univ., St. Louis, Mo.), and E. H. Dunlop (Washington Univ., St. Louis, Mo.) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 287-313 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Microbial food sources are becoming viable and more efficient alternatives to conventional food sources especially in the context of Closed Ecological Life Support Systems (CELSS) in space habitats. Since bioreactor designs for terrestrial operation will not readily apply to conditions of microgravity, there is an urgent need to learn about the differences. These differences cannot be easily estimated due to the complex nature of the mass transport and mixing mechanisms in fermenters. Therefore, a systematic and expeditious experimental program must be undertaken to obtain the engineering data necessary to lay down the foundations of designing bioreactors for microgravity. Two bioreactor design concepts presented represent two dissimilar approaches to grappling with the absence of gravity in space habitats and deserve to be tested for adoption as important components of the life support function aboard spacecrafts, space stations and other extra-terrestrial habitats. R.J.F.

N86-19927*# Martin Marietta Corp., Baltimore, Md.
AN ANALYSIS OF THE PRODUCTIVITY OF A CELSS CONTINUOUS ALGAL CULTURE SYSTEM
R. Radmer, P. Behrens, E. Fernandez, and K. Arnett *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 315-328 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

One of the most attractive aspects of using algal cultures as plant components for a Closed Ecological Life Support Systems (CELSS) is the efficiency with which they can be grown. Although algae are not necessarily intrinsically more efficient than higher plants, the ease which they can be handled and manipulated (more like chemical reagents than plants), and the culturing techniques available, result in much higher growth rates than are usually attainable with higher plants. Furthermore, preliminary experiments have demonstrated that algal growth and physiology is not detectable altered in a microgravity environment, (1) whereas the response of higher plants to zero gravity is unknown. In order to rationally design and operate culture systems, it is necessary to understand how the macroparameters of a culture system, e.g., productivity, are related to the physiological aspects of the algal culture. A first principles analysis of culture system is discussed, and a mathematical model that describes the relationship of culture productivity to the cell concentration of light-limited culture is derived. The predicted productivity vs cell concentration curve agrees well with the experimental data obtained to test this model, indicating that this model permits an accurate prediction of culture productivity given the growth parameters of the system. R.J.F.

N86-19928*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEVELOPMENT OF AN UNCONVENTIONAL FOOD REGENERATION PROCESS: QUANTIFYING THE NUTRITIONAL COMPONENTS OF A MODEL METHYLOTROPHIC YEAST
Gene R. Petersen and Barry O. Stokes (Biomass International, Ogden, Utah) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 329-338 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

A hybrid chemical/biological approach to unconventional food regeneration is discussed. Carbon dioxide and water, the major wastes of human metabolism would be converted to methanol by one of several physiochemical processes available (thermal, photocatalytic, etc.). Methanol is then used to supply carbon and energy for the culture of microorganisms which in turn produce biological useful basic food stuffs for human nutrition. Our work has focused on increasing the carbohydrate levels of a candidate methylotrophic yeast to more nearly coincide with human nutritional requirements. Yeasts were chosen due to their high carbohydrate levels compared to bacteria and their present familiarity in the human diet. The initial candidate yeast studied was a thermotolerant strain of Hansenula polymor pha, DL-1. The quantitative results that permit an evaluation of the overall efficiency in hybrid chemical/biological food production schemes are discussed. A preliminary evaluation of the overall efficiency of such schemes is also discussed. R.J.G.

N86-19929*# California Univ., Berkeley. Lawrence Berkeley Lab. Membrane Bioenergetics Group.
APPLICATION OF PHOTOSYNTHETIC N2-FIXING CYANOBACTERIA TO THE CELSS PROGRAM
Lester Packer, Ian Fry, and Shimshon Belkin *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 339-352 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Commercially available air lift fermentors were used to simultaneously monitor biomass production, N2-fixation, photosynthesis, respiration, and sensitivity to oxidative damage during growth under various nutritional and light regimes, to establish a data base for the integration of these organisms into a Closed Ecological Life Support System (CELSS) program. Certain cyanobacterial species have the unique ability to reduce atmospheric N2 to organic nitrogen. These organisms combine the ease of cultivation characteristics of prokaryotes with the fully developed photosynthetic apparatus of higher plants. This, along with their ability to adapt to changes in their environment by modulation of certain biochemical pathways, make them attractive candidates for incorporation into the CELSS program. R.J.F.

N86-19930*# Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.
CARBON DIOXIDE EVOLUTION RATE AS A METHOD TO MONITOR AND CONTROL AN AEROBIC BIOLOGICAL WASTE TREATMENT SYSTEM
S. S. Lee and M. L. Shuler *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 354-391 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

An experimental system was developed to study the microbial growth kinetic of an undefined mixed culture in an erobic biological waste treatment process. The experimental results were used to develop a mathematical model that can predict the performance of a bioreactor. The bioreactor will be used to regeneratively treat waste material which is expected to be generated during a long term manned space mission. Since the presence of insoluble particles in the chemically undefined complex media made estimating biomass very difficult in the real system, a clean system was devised to study the microbial growth from the soluble substrate. R.J.F.

N86-19931*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
CAN PLANTS GROW IN QUASI-VACUUM?
M. Andre and Ch. Richaud *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 395-404 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

It was found that the growth of plants is possible under absolute pressure 14 times lower than the atmospheric pressure. In first approximation, plants ignore the absence of nitrogen and only react to the partial pressure of O2. Hence the growth of plantlets was delayed under low pressures of O2 in both cases with and without nitrogen. The CO2 availability being limited by the carbon content of the seed, the final results after 20 days were very similar. R.J.F.

N86-19932*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
WHEAT RESPONSE TO CO2 ENRICHMENT: CO2 EXCHANGES TRANSPIRATION AND MINERAL UPTAKES
M. Andre, H. DuCloux, and Ch. Richaud *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 405-428 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

When simulating canopies planted in varied densities, researchers were able to demonstrate that increase of dry matter production by enhancing CO2 quickly becomes independant of increase of leaf area, especially above leaf area index of 2; dry matter gain results mainly from photosynthesis stimulation per unit of surface (primary CO2 effect). When crop density is low (the plants remaining alone a longer time), the effects of increasing leaf surface (tillering, leaf elongation here, branching for other plants etc.) was noticeable and dry matter simulation factor reached 1.65. This area effect decreased when canopy was closed in, as the effect of different surfaces no longer worked. The stimulation of photosynthesis reached to the primary CO2 effect. The accumulation in dry matter which was fast during that phase made the original weight advantage more and more neglectible. Comparison with short term measurements showed that first order long term effect of CO2 in wheat is predictible with short term experiment, from the effect of CO2 on photosynthesis measured on reference sample. R.J.F.

N86-19933*# California Univ., Davis. Plant Growth Lab.
EFFECTS OF NO3(-) AND NH4(+) AND UREA ON EACH OTHER'S UPTAKE AND INCORPORATION
Ray C. Huffaker and Michael R. Ward *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 429-445 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The purpose was to determine the optimal use by wheat plants of the N sources expected from processing biological waste products, NO3(-),NO2(-)NH4(+), and urea. The approach was to determine the uptake and metabolic products of each N source (from single and multiple component solutions), inhibitory effects of each, feedback inhibition, and overall in vivo regulation of the rates of assimilation of each by wheat plants. Previously, researchers determined the interactions of NO3(-),NO2(-),NH4(+) on each other's uptake and incorporation. The assimilation and some of its effects on NO3(-) and NH4(+) assimilation which have been completed to data are discussed. R.J.F.

N86-19934*# Utah State Univ., Logan. Plant Science Dept.
STUDIES ON MAXIMUM YIELD OF WHEAT FOR THE CONTROLLED ENVIRONMENTS OF SPACE
Bruce G. Bugbee and Frank B. Salisbury *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 447-485 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The economic feasibility of using food-producing crop plants in a closed ecological Life-Support System (CELSS) will ultimately depend on the energy and area (or volume) required to provide the nutritional requirements for each person. Energy and area requirements are, to some extent, inversely related; that is, an increased energy input results in a decreased area requirement and vice versa. A major goal of the research effort was to determine the controlled-environment good-production efficiency of wheat per unit area, per unit time, and per unit energy input. R.J.F.

N86-19935*# Wisconsin Univ., Madison. Dept. of Horticulture.
UTILIZATION OF POTATOES IN CELSS: PRODUCTIVITY AND GROWING SYSTEMS
T. W. Tibbitts *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 487-498 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The potato plant (solanum tuberosum L.) is one of the basic food crops that should be studied for use in NASA's closed Ecological Life Support System (CELSS). It offers high yields per unit area and time, with most of this production in the form of highly digestible carbohydrate. Potatoes, like wheat and rice, are particularly useful in human diets because of their nutritional versatility and ease of processing and preparation. The growth of the potato was studied and it was found to be a useful species for life support systems. R.J.F.

N86-19936*# Purdue Univ., West Lafayette, Ind. Dept. of Horticulture.
OPTIMIZATION OF CONTROLLED ENVIRONMENTS FOR HYDROPONIC PRODUCTION OF LEAF LETTUCE FOR HUMAN LIFE SUPPORT IN CELSS
Cary A. Mitchell, Sharon L. Knight, and Tameria L. Ford *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 499-521 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

A research project in the food production group of the Closed Ecological Life Support System (CELSS) program sought to define optimum conditions for photosynthetic productivity of a higher plant food crop. The effects of radiation and various atmospheric compositions were studied. R.J.F.

N86-19937*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CLOSED CULTURE PLANT STUDIES: IMPLICATIONS FOR CELSS
Takashi Hoshizaki *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 523-540 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Arabidopsis plants were grown in closed cultures similar to those used in space experiments. A shift in metabolism from photosynthesis to respiration is indicated by the accumulation of CO2 in the culture atmosphere. Reproductive growth is suppressed. Plant growth and development is apparently related to the atmospheric volume available to each plant. The implications of these findings to closed ecological systems are given: (1) there is a need for an open culture having ample gas exchange, (2) CO2 levels must be maintained within prescribed limits, (3) the minimum atmospheric volume required for each plant is dependent on the precision of the gas monitors and of the subsystems used to maintain appropriate levels of various atmospheric components, and (4) volatiles such as ethylene and terpenes emanating from plants be monitored and reduced to benign concentrations. R.J.F.

N86-19938*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A METHOD FOR SCREENING OF PLANT SPECIES FOR SPACE USE
J. D. Goeschl (Phytokinetics, Inc., College Station, Tex.), R. L. Sauer, and H. W. Scheld (PhytoResource Research, Inc., College Station, Tex.) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 541-554 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

A cost-effective methodology which monitors numerous dynamic aspects of carbon assimilation and allocation kinetics in

live, intact plants is discussed. Analogous methods can apply to nitrogen uptake and allocation. This methodology capitalizes on the special properties of the short-lived, positron-gamma emitting isotope C-11 especially when applied as CO2-11 in a special extended square wave (ESW) pattern. The 20.4 minute half-life allows for repeated or continuous experiments on the same plant over periods of minutes, hours, days, or weeks. The steady-state isotope equilibrium approached during the ESW experiments, and the parameters which can be analyzed by this technique are also direct results of that short half-life. Additionally, the paired .511 MeV gamma rays penetrate any amount of tissue and their 180 deg opposite orientation provides good collimation and allows coincidence counting which nearly eliminates background. R.J.F.

N86-19939*# Wisconsin Univ., Madison. Dept. of Horticulture.
POTATO LEAF EXPLANTS AS A SPACEFLIGHT PLANT TEST SYSTEM
Raymond M. Wheeler *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 555-564 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The use of explant tissues or organs may circumvent limitations facing whole-plant experimentation during spaceflight. In the case of potato, a crop currently being studied for application to bioregenerative life support systems, excised leaves and their subtended axillary buds can be used to test a variety of stem growth and development phases ranging from tubers through stolons (horizontal stems) to upright leafy shoots. The leaves can be fit well into small-volume test packages and sustained under relatively low irradiance levels using light-weight growing media. Tubers formed on potato leaf cuttings can yield up from 0.5 to 1.0 g fresh mass 10 days after excision and up to 2.0 g or more, 14 days from excision. Author

N86-19940*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF ULTRADIAN AND ORBITAL CYCLES ON PLANT GROWTH
Wade Berry (California Univ., Los Angeles), Takashi Hoshizaki, and Albert Ulrich (California Univ., Berkeley) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 565-575 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

In a series of experiments using sugar beets, researchers investigated the effects of varying cycles lengths on growth (0.37 hr to 48 hr). Each cycle was equally divided into a light and dark period so that each treatment regardless of cycle length received the same amount of light over the 17 weeks of the experiment. Two growth parameters were used to evaluate the effects of cycle length, total fresh weight and sucrose content of the storage root. Both parameters showed very similar responses in that under long cycles (12 hr or greater) growth was normal, whereas plants growing under shorter cycle periods were progressively inhibited. Minimum growth occurred at a cycle period of 0.75 hr. The yield at the 0.75 hr cycle, where was at a minimum, for total fresh weight was only 51 percent compared to the 24 hr cycle. The yield of sucrose was even more reduced at 41 percent of the 24 hr cycle. R.J.F.

N86-19941*# North Carolina State Univ., Raleigh. Dept. of Soil Science.
NITROGEN UPTAKE AND UTILIZATION BY INTACT PLANTS
C. David Raper, Jr. and Leslie C. Tolley-Henry *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 577-594 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The results of experiments support the proposed conceptual model that relates nitrogen uptake activity by plants as a balanced interdependence between the carbon-supplying function of the shoot and the nitrogen-supplying function of the roots. The data are being used to modify a dynamic simulation of plant growth, which presently describes carbon flows through the plant, to describe nitrogen uptake and assimilation within the plant system. Although several models have been proposed to predict nitrogen uptake and partitioning, they emphasize root characteristics affecting nutrient uptake and relay on empirical methods to describe the relationship between nitrogen and carbon flows within the plant. Researchers, on the other hand, propose to continue to attempt a mechanistic solution in which the effects of environment on nitrogen (as well as carbon) assimilation are incorporated through their direct effects on photosynthesis, respiration, and aging processes. R.J.F.

N86-19942*# North Dakota State Univ., Fargo. Dept. of Plant Pathology.
THE ROLE OF PLANT DISEASE IN THE DEVELOPMENT OF CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS
Berlin Nelson *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 595-610 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

Plant diseases could be important factors affecting growth of higher plants in Closed Ecological Life Support Systems (CELSS). Disease control, therefore, will be needed to maintain healthy plants. The most important controls should be aimed at preventing the introduction, reproduction and spread of pathogens and preventing plant infection. An integrared ease control program will maximize that approach. In the design and operation of CELSS, plant disease should be considered an important aspect of plant growth. The effects of plant diseases are reviewed and several disease control measures are discussed. R.J.F.

N86-19943*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT OF SPACE TECHNOLOGY FOR ECOLOGICAL HABITATS
Norman V. Martello *In* NASA. Ames Research Center Controlled Ecological Life Support Systems Jan. 1986 p 613-625 refs (For primary document see N86-19906 10-54)
Avail: NTIS HC A99/MF A01 CSCL 06K

The development of closed ecological systems for space stations is discussed. Growth chambers, control systems, microgravity, ecosystem stability, lighting equipment, and waste processing systems are among the topics discussed. R.J.F.

N86-19944# Navy Clothing and Textile Research Facility, Natick, Mass.
REFURBISHING SPRAY ON ALUMINUM ENAMEL ON PROXIMITY CLOTHING Final Technical Report, Oct. 1982 - Sep. 1983
H. Winer, J. Walker, P. Campbell, and J. Calfee Jul. 1985 25 p (Contract MIPR-N-82-29; DA Proj. 250-5)
(AD-A159707; AFESC/ESL-TR-84-17) Avail: NTIS HC A02/MF A01 CSCL 06/17

The Navy Clothing and Textile Research Facility studied the effectiveness of refurbishing the aluminum coating on worn aluminized proximity firefighters' clothing. It was thought that, if a spray-on aluminum enamel could restore the surface aluminum coating to an acceptable level of infrared radiant heat reflectance, then the clothing could be worn for an extended period of time, reducing replacement costs. Vacuum-deposited aluminum fabric specimens were cut from worn firefighters' clothing and tested for their thermal transmission at three levels of heat flux. Before heat-testing, each specimen was identified as to its percentage of infrared reflectance at 1100 nanometers and, subjectively, by visually observing the worn aluminized surface. This report describes the laboratory investigation of two spray-on aluminum enamel coatings over worn aluminized fabric to obtain data that would allow a judgment as to their effectiveness, as well as the effectiveness of all spray-on aluminum enamel, to extend the use-life of proximity firefighters' clothing. GRA

N86-19945# Army Aeromedical Research Lab., Fort Rucker, Ala.
DYNAMICS OF HEAD PROTECTION (IMPACT PROTECTIVE COMPARISON OF THE SPH-4 FLIGHT HELMET TO A COM-

MERCIAL MOTORCYCLE HELMET)
R. F. Rolsten and J. L. Haley, Jr. Jul. 1985 37 p
(AD-A161164; USAARL-85-5) Avail: NTIS HC A03/MF A01 CSCL 06/17

The impact protection provided by a commercial motorcycle helmet is evaluated in this report. The motorcycle helmet utilizes an expanded plastic foam liner of 12 mm thickness, which is less than that used in most motorcycle helmets made in this country today. The thickness of the foam is identical to that used in the US Army Aviator's standard Sound Protective Helmet No. 4 (SPH-4). The impact protection provided by the commercial helmet is compared to the protection provided by the SPH-4 aviator helmet. GRA

N86-19946# Army Aeromedical Research Lab., Fort Rucker, Ala.
HELICOPTER-REFERENCED SINGLE CONTROL, CENTER-POSITION FORCE EXERTION CAPABILITIES OF MALES AND FEMALES Final Report
Aaron W. Schopper and George R. Mastroianni Aug. 1985 60 p
(DA Proj. 3E1-62777-A-879)
(AD-A161234; USAARL-85-4) Avail: NTIS HC A04/MF A01 CSCL 06/16

In response to the need for reevaluation of anthropometric criteria contained in the US Army medical standards for flying duty, an assessment was made of helicopter-control-referenced force exertion capabilities of a sample of Army males and females. Males (N=74) ranged from 159 cm through 196 cm in stature; females (N=66) ranged from 152 cm through 183 cm. The force-exertion data were compared to values cited in MIL-H-8501A as upper force limits for the design of helicopter controls. The focuses of the analyses were upon the force exertion capabilities of individuals 167 cm and below in stature since, by virtue of their relatively small size, they represent the portion of the population which are most apt to evidence inabilities to exert forces which equal or exceed control force design limits. The comparison revealed that, overall, the presently existing limits (published in 1961) for other-than-the normal operational flight envelope exceeded the force exertion capabilities of 10% of the 39 small males evaluated and 27% of the 56 females evaluated. Most failures to achieve existing or proposed control force design limits occurred because of inabilities to attain criterion-level exertion data from the small individuals of this study, various combinations of specific control force design limits were evaluated to develop estimations of overall set-wise failure rates likely to be encountered during possible future strength testing/screening. GRA

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N86-19947*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A PARTITIONING STRATEGY FOR NONUNIFORM PROBLEMS ON MULTIPROCESSORS Final Report
Marsha J. Berger (New York Univ., N.Y.) and Shahid Bokhari Nov. 1985 30 p refs
(Contracts NAS1-17070; DE-AC02-76ER-03077-V)
(NASA-CR-178024; ICASE-85-55; NAS 1.26:178024) Avail: NTIS HC A03/MF A01 CSCL 12A

The partitioning of a problem on a domain with unequal work estimates in different subddomains is considered in a way that balances the work load across multiple processors. Such a problem arises for example in solving partial differential equations using an adaptive method that places extra grid points in certain subregions of the domain. A binary decomposition of the domain is used to partition it into rectangles requiring equal computational effort. The communication costs of mapping this partitioning onto different microprocessors: a mesh-connected array, a tree machine and a hypercube is then studied. The communication cost expressions can be used to determine the optimal depth of the above partitioning. Author

N86-19948*# Allied Bendix Aerospace, Teterboro, N.J. Flight Systems Div.
THE DEVELOPMENT OF AN INTERIM GENERALIZED GATE LOGIC SOFTWARE SIMULATOR
J. G. McGough and S. Nemeroff Dec. 1985 178 p refs
(Contract NAS1-15946)
(NASA-CR-177939; NAS 1.26:177939) Avail: NTIS HC A09/MF A01 CSCL 09B

A proof-of-concept computer program called IGGLOSS (Interim Generalized Gate Logic Software Simulator) was developed and is discussed. The simulator engine was designed to perform stochastic estimation of self test coverage (fault-detection latency times) of digital computers or systems. A major attribute of the IGGLOSS is its high-speed simulation: 9.5 x 1,000,000 gates/cpu sec for nonfaulted circuits and 4.4 x 1,000,000 gates/cpu sec for faulted circuits on a VAX 11/780 host computer. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N86-19949*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GRAPHICS MINI MANUAL: AN INTRODUCTION TO GRAPHICS AT LANGLEY RESEARCH CENTER
Nancy L. Taylor, Donald P. Randall, Christine G. Matthews, Raymond L. Gates, John T. Bowen, Kennie H. Jones, William H. vonOfenheim, Arthur L. Gooden, Mary M. Johnson, Eric L. Everton et al Sep. 1985 72 p
(NASA-TM-87622; NAS 1.15:87622) Avail: NTIS HC A04/MF A01 CSCL 09B

Users are introduced to the computer graphics capabilities available at the NASA Langley Research Center to assist them in their use. More specifically, the manual identifies and describes the various graphics software and hardware components, details the interfaces between these components, and provides information concerning the use of these components at LaRC. Author

N86-19950*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A PROCESS ACTIVITY MONITOR FOR AOS/VS
R. A. McKosky (Rockwell International), S. W. Lindley (Rockwell International), and J. S. Chapman Washington Jan. 1986 30 p
(NASA-TM-86535; NAS 1.15:86535) Avail: NTIS HC A03/MF A01 CSCL 09B

With the ever increasing concern for computer security, users of computer systems are becoming more sensitive to unauthorized access. One of the initial security concerns for the Shuttle Management Information System was the problem of users leaving their workstations unattended while still connected to the system. This common habit was a concern for two reasons: it ties up resources unnecessarily and it opens the way for unauthorized access to the system. The Data General MV/10000 does not come equipped with an automatic time-out option on interactive peripherals. The purpose of this memorandum is to describe a system which monitors process activity on the system and

disconnects those users who show no activity for some time quantum. Author

N86-19951# California Univ., San Diego. Inst. for Cognitive Science.
DIRECT MANIPULTION INTERFACES
E. I. Hutchins, J. D. Hollan, and D. A. Norman May 1985 41 p
(Contract N00014-85-C-0133)
(AD-A156761; ICS-8503) Avail: NTIS HC A03/MF A01 CSCL 09/2

A cognitive account of both the advantages and disadvantages of direct manipulation interfaces is given. Two underlying phenomena that give rise to the sensation of directness are identified. One has to do with the information processing distance between the user's intentions and the facilities provided by the machine. Reduction of this distance makes the interface feel direct by reducing the effort required of the user to accomplish goals. The second phenomenon concerns the relation between the input and output vocabularies of the interface language. In particular, direct manipulation requires that the system provide representations of the objects of interest that behave as if they are the objects themselves. This provides the sensation of directness of manipulation. GRA

N86-19952# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
ADAPTIVE HYBRID PICTURE CODING. VOLUME 1 Final Report, 1 Oct. 1983 - 30 Sep. 1984
R. A. Jones, C. D. Bowling, and Y. J. Tejwani 1 Feb. 1985 179 p
(Grant AF-AFOSR-0351-82)
(AD-A160316; AFOSR-85-0740TR-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09/2

With the introduction and proliferation of computers into all facets of the work place and the home environment, a new awareness of the capabilities and short-comings of the computer for various tasks has been found. The computer has proven very useful in performing repetitive, mundane tasks in offices and manufacturing process control environments, but lack of a good real-world/computer interface prohibits many uses. Presently a computers input connections to the real-world consist mainly of a keyboard and in some instances joysticks, graphics pads, light pens, and other sensors of the physical world. Recent research into this interface has provided the computer with ears, that is to say speech recognition. Not only can the computer hear, but it can also act upon human voice commands and speech. A voice and associated language generation has also recently become a reality. The computer can generate syntactically correct language and then change this into intelligible human sounding speech. Perhaps the most important, and by far the most complex, interface would be the one which gives the computer eyes or sight. Providing the computer with eyes and vision opens new realms for computer automation that in the past were either too difficult to perform blindly or completely impossible. GRA

N86-19953# Texas Univ., Austin. Dept. of Electrical and Computer Engineering.
SOME COMMENTS ON THE DESIGN OF QUANTIZERS Interim Report, 1 Oct. 1980 - 30 Sep. 1985
E. F. Abaya and G. L. Wise 30 May 1985 9 p Presented at the Anual Allerton Conference, Communication, Control, and Computing, 3-5 Oct. 1984, Monticello, Ill.
(Grant AF-AFOSR-0047-81)
(AD-A160321; AFOSR-85-0774TR) Avail: NTIS HC A02/MF A01 CSCL 09/5

In many applications involving quantization the probability distribution of the input signal is unknown. However, most of the algorithms for optimal scalar or vector quantization require an explicit distribution function or probability density. This paper shows that under certain conditions reasonable quantizer designs can be expected when standard algorithms are applied to estimates of distribution functions. GRA

N86-19954# Computer Sciences Corp., Falls Church, Va. Systems Div.
SCCE REHOSTING FEASIBILITY ASSESSMENT
S. Dressler, B. Kerns, W. Nakisher, and P. C. Wood 31 Oct. 1985 169 p
(Contract DCA100-81-C-0044)
(AD-A161158) Avail: NTIS HC A08/MF A01 CSCL 17/2

The Office of the Secretary of Defense (OSD) has directed that a Survivable DSCS Control System (SDCS), including an SCCE, be developed. The SDCS is required to provide a survivable, autonomous minimal DSCS III network control capability. The SDCS will be a transportable configuration that meets stringent environmental requirements. The SCCE's MODCOMP Classic II/75 computer will not meet the environmental requirements of the SDCS. Consequently, it will be necessary to rehost the SCCE to a militarized computer. Within the DSCSOC, several DOCS subsystems use DEC VAX computers. These subsystems will be incorporated into the SDCS, and will require rehosting to a militarized computer. Applications on the DEC VAX computers will run on the Norden Systems Inc. line of MIL VAX computers with minimal software conversion. Thus, these subsystems will likely be rehosted to MIL VAX computers. Consequently, in order to improve the commonality of computer equipment and simplify the logistic support of the SDCS, the Norden Systems Incorporated line of militarized VAX computers is a prime candidate for the rehosting of the SCCE in the SDCS. GRA

N86-19955# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
COMPUTER TECHNIQUES FOR PRODUCING COLOR MAPS Final Report
Albert N. Williamson, Jr. Aug. 1985 43 p Original contains color illustrations
(DA Proj. 4A1-62719-AT-40)
(AD-A161159; WES/MP/GL-85-13) Avail: NTIS HC A03/MF A01 CSCL 08/2

This report discusses a technique for encoding maps in a manner that permits rapid production of window maps and color separations. The discussion includes a description of equipment, data processing procedures, and an example of their use for verifying quantitative terrain information for input to an analytical model. A derivation used to portray the output of the Army Mobility Model as a vehicle performance map is described in an appendix. Author (GRA)

N86-19956# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
LOW POWER, RADIATION HARD GaAs RAM Semiannual Report, 10 Dec. 1983 - 9 Jun. 1984
R. Vahrenkamp, K. Elliot, R. Zucca, and E. Walton Mar. 1985 28 p
(Contract MDA903-83-C-0067; ARPA Order 4100)
(AD-A161160; MRDC41131.9SA) Avail: NTIS HC A03/MF A01 CSCL 09/5

The scope of this program is to demonstrate a 1K GaAs static RAM having very low power dissipation and short access time to meet the requirements of the DARPA Advanced On-Board Signal Processer (AOSP). Device isolation and backgating studies were performed, subthreshold uniformity measurements made, and a new RAM design using transmission gates finalized. Proton damage has proven to be an effective technique for maximizing device isolation for ultra-low power RAM circuits. However, backgating still remains as a possible yield limiting factor. Backgating measurements have been performed on test structures to determine the influence of backgating in proton isolated material with differing acceptor content. The results have been used to refine models for backgating and to identify properties of the starting GaAs material which affect backgating and isolation. A technique to characterize FET devices within a RAM has been successfully developed. It applies to test arrays of 224 (16 x 14) RAM cells extracted from the 1K RAM, and which have each row word-line, and each column bit-sense line connected to a contact pad. With a proper biasing scheme, and using our parametric test system,

the subthreshold characteristic of the output FET in each of the 72 cells forming the central core of the array can be measured individually. The device characteristics appear uniform and well behaved, as expected from measurements on single devices. The design of a transmission gate RAM has been completed and will be implemented on the RM5 mask set. GRA

N86-19957# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
DESIGN AND IMPLEMENTATION OF A RELATIONAL DATABASE MANAGEMENT SYSTEM FOR THE AFIT THESIS PROCESS M.S. Thesis
Joseph D. Perkumas Sep. 1985 92 p
(AD-A161217; AFIT/GLM/LSH/85S-63) Avail: NTIS HC A05/MF A01 CSCL 09/2

The purpose of this study was to evaluate the feasibility of implementing a computerized data base management system to support the AFIT thesis process. A data base was designed and implemented using a relational data base management system. Although the data base was limited to thesis topics and advisors, this system would be useful for other supervisory and administrative functions. GRA

N86-19958# Yale Univ., New Haven, Conn. Dept. of Computer Science.
TEMPORAL IMAGERY. AN APPROACH TO REASONING ABOUT TIME FOR PLANNING AND PROBLEM SOLVING
Thomas Dean Oct. 1985 271 p
(Contract N00014-83-K-0281)
(AD-A161242; YALEU/CSD/RR-433) Avail: NTIS HC A12/MF A01 CSCL 09/2

Reasoning about time typically involves drawing conclusions on the basis of incomplete information. Uncertainty arises in the form of ignorance, indeterminacy, and indecision. Despite the lack of complete information a problem solver is continually forced to make predictions in order to pursue hypotheses and plan for the future. Such predictions are frequently contravened by subsequent evidence. This dissertation presents a computational approach to temporal reasoning that directly confronts these issues. The approach centers around techniques for managing a data base of assertions corresponding to the occurrence of events and the persistence of their effects over time. The resulting computational framework performs the temporal analog of (static) reason maintenance (Doyle 79) by keeping track of dependency information involving assumptions about the truth of facts spanning various intervals of time. The system developed in this dissertation extends classical predicate-calculus data bases, such as those used by Prolog (Bowen 81), to deal with time in an efficient and natural manner. Applications in robot problem solving are stressed, but examples drawn from other applications areas are used to demonstrate the generality of the techniques. GRA

N86-19959# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
SUPERCOMPUTERS, ARCHITECTURE AND VECTORIZATION [SUPERCOMPUTERS: ARCHITECTUUR EN VECTORISEREN]
R. A. A. M. Geilleit Jul. 1984 15 p refs In DUTCH
(IWIS-B-84-TW-57) Avail: NTIS HC A02/MF A01

The concept of supercomputers is explained by describing the architecture of a CDC CYBER 205 and a CRAY-1S as examples. Special requirements for an efficient use are discussed; the concept of vectorization is illustrated. Author (ESA)

N86-19960# Office of Technology Assessment, Washington, D.C.
INFORMATION TECHNOLOGY R AND D: CRITICAL TRENDS AND ISSUES
Feb. 1985 52 p
(PB85-245660; OTA-CIT-268; LC-84-601150) Avail: NTIS HC A04/MF A01 CSCL 09B

Four specific areas of research as case studies are examined: (1) computer architecture; (2) artificial intelligence; (3) fiber optics; and (4) software engineering. The structure and orientation of some selected foreign programs are discussed. A set of issues that have been raised in the course of the study manpower, institutional change and the new research organizations that grew out of Bell Laboratories and implications of trends in overall science and technology policy are examined. GRA

N86-19961# Transportation Research Board, Washington, D.C.
PROCEEDINGS OF THE WORKSHOP ON MICROCOMPUTERS IN TRANSIT: ISSUES AND DIRECTIONS Final Report
Edythe Taylor Crump, ed. Jul. 1985 75 p refs Workshop held at Airlie Houst, Va., 4-6 Nov. 1984
(Grant OT-UMTA-CD-06-0441)
(PB85-246924; UMTA-DC-06-0441-85-1) Avail: NTIS HC A04/MF A01 CSCL 09B

The Workshop on Microcomputers in Transit: Issues and Directions, held November 4 to 6 1984 at Airlie House, Virginia is reported. The workshop was organized to determine the role that Urban Mass Transportation Administration (UMTA) should play in this area and to provide information to states and local bodies for their programs. Information on the latest developments was exchanged good and bad practices were determined and courses of action for advancing the application of microcomputers in transit-related organizations were recommended. The state-of-the-art was defined application of microcomputer technology, identification of institutional problems and solutions, find ways to improve the dissemination of current knowledge, and specification of research needs and priorities are discussed. GRA

N86-19488# Joint Publications Research Service, Arlington, Va.
CAPITALIZING ON AVAILABLE INFORMATION
Jiro Hiraishi *In its* Japan Report: Science and Technology (JPRS-JST-86-002) 27 Jan. 1986 p 63-70 Transl. into ENGLISH from Kogyo Gijutsu (Tokyo, Japan), Jun. 1985 p 30-35 (For primary document see N86-19484 10-31)
Avail: NTIS HC A06/MF A01

N86-19830# Joint Publications Research Service, Arlington, Va.
COMPUTER GRAPHICS EMPLOYED IN MODELING PROTEIN MOLECULES
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) 2 Jan. 1986 p 10 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 5 Sep. 1985 p 4 (For primary document see N86-19828 10-51)
Avail: NTIS HC A06

N86-19975*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN EVALUATION OF PROGRAMMER/ANALYST WORKSTATIONS
K. Koerner (Computer Sciences Corp., Silver Spring, Md.), R. Mital (Computer Sciences Corp., Silver Spring, Md.), D. Card (Computer Sciences Corp., Silver Spring, Md.), and A. Maione *In its* Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 178-195 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N86-19962* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOFTWARE ENGINEERING LABORATORY (SEL) DATA BASE RETRIEVAL SYSTEM (DARES) SYSTEM DESCRIPTION
Aug. 1984 371 p refs
(NASA-TM-88589; SEL-83-105; NAS 1.15:88589) Avail: NASA. Goddard Space Flight Center, Greenbelt, Md. 20771 CSCL 09B

The Software Engineering Laboratory Data Base Retrieval System (DARES) system description is presented. DARES provides data base users with two types of access to development project

data: (1) reports summarizing the data in the data base; and (2) options to extract and move selected data into a work area from which user defined or predefined reports and plots may be produced. An overview of DARES is presented; the processing performed is described; and subroutines, COMMON blocks, file layouts, and system generation procedures are given. Author

N86-19963* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORTRAN STATIC SOURCE CODE ANALYZER PROGRAM (SAP) SYSTEM DESCRIPTION: REVISION 1
Apr. 1985 214 p refs
(NASA-TM-88592; SEL-82-102; NAS 1.15:88592) Avail: NASA. Goddard Space Flight Center, Greenbelt, Md. 20771 CSCL 09B

The FORTRAN Static Source Code Analyzer Program (SAP) system description is presented. SAP is a software tool designed to assist Software Engineering Laboratory (SEL) personnel in conducting studies of FORTRAN programs. SAP scans FORTRAN source code and produces reports that present statistics and measures of statements and structures that make up a module. The processing performed by SAP; the routines, COMMON blocks, and files used by SAP; and the SAP system generation procedure are all described. The SAP tool specifies on the VAX-11/780, Version 3 is followed. The IBM 4341 is the batch Version 3. Departures from the VAX-11/780 version are noted. The PDP-11/70 version is an older version and is presented elsewhere. Author

N86-19964* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORTRAN STATIC SOURCE CODE ANALYZER PROGRAM (SAP) USER'S GUIDE: REVISION 2
Apr. 1985 131 p refs
(NASA-TM-88586; SEL-78-202; NAS 1.15:88586) Avail: NASA. Goddard Space Flight Center, Greenbelt, Md. 20771 CSCL 09B

The FORTRAN Static Source Code Analyzer Program (SAP) User's Guide (Revision 2) is presented. SAP is a software tool designed to assist Software Engineering Laboratory (SEL) personnel in conducting studies of FORTRAN programs. SAP scans FORTRAN source code and produces reports that present statistics and measures of statements and structures that make up a module. Instructions are provided for operating SAP and contains information useful in interpreting SAP output. It is the result of program modifications to update several reports, additional software quality analysis, and recognition of all statements described in the FORTRAN dialects of the host VAX-11/780 and IBM 4341 computers. Author

N86-19965*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF SOFTWARE VERIFICATION TECHNIQUES
Apr. 1985 116 p refs
(NASA-TM-88585; NAS 1.15:88585; SEL-85-001) Avail: NTIS HC A06/MF A01 CSCL 09B

A controlled experiment performed by the Software Engineering Laboratory (SEL) to compare the effectiveness of code reading, functional testing, and structural testing as software verification techniques is described. The experiment results indicate that code reading provides the greatest error detection capability at the lowest cost, whereas structural testing is the least effective technique. The experiment plan is explained, the experiment results are described, related results from other studies are discussed. The application of these results to the development of software in the flight dynamics environment is considered. Appendices summarize the experiment data and list the test programs. Author

N86-19966*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOFTWARE VERIFICATION AND TESTING
Dec. 1985 65 p refs
(NASA-TM-88587; NAS 1.15:88587; SEL-85-005) Avail: NTIS HC A04/MF A01 CSCL 09B

General procedures for software verification and validation are provided as a guide for managers, programmers, and analysts involved in software development. The verification and validation procedures described are based primarily on testing techniques. Testing refers to the execution of all or part of a software system for the purpose of detecting errors. Planning, execution, and analysis of tests are outlined in this document. Code reading and static analysis techniques for software verification are also described. Author

N86-19967*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEEDINGS OF THE NINTH ANNUAL SOFTWARE ENGINEERING WORKSHOP
Nov. 1984 361 p refs Workshop held in Greenbelt, Md., 28 Nov. 1984
(NASA-TM-88594; SEL-84-004; NAS 1.15:88594) Avail: NTIS HC A16/MF A01 CSCL 09B

Experiences in measurement, utilization, and evaluation of software methodologies, models, and tools are discussed. NASA's involvement in ever larger and more complex systems, like the space station project, provides a motive for the support of software engineering research and the exchange of ideas in such forums. The topics of current SEL research are software error studies, experiments with software development, and software tools. For individual titles, see N86-19968 through N86-19980.

N86-19968*# Computer Sciences Corp., Silver Spring, Md.
AN APPROACH TO DEVELOPING SPECIFICATION MEASURES
William W. Agresti *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 14-41 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

An approach to developing specification measures is described. A key feature of the approach is the introduction of a new requirements representation, the Composite Specification Model (CSM). Results are reported from an experiment in which the requirements for a real system are recast using the CSM. Specification measures are then extracted from the CSM representation of the system. Author

N86-19969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATING SOFTWARE TESTING STRATEGIES
Richard W. Selby, Jr. (Maryland Univ., College Park), Victor R. Basili, Jerry Page (Maryland Univ., College Park), and Frank E. McGarry *In its* Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 42-64 refs (For primary document see N86-19967 10-61)
(Grant NsG-5123; Contract F49620-80-C-001)
Avail: NTIS HC A16/MF A01

The strategies of code reading, functional testing, and structural testing are compared in three aspects of software testing: fault detection effectiveness, fault detection cost, and classes of faults detected. The major results are the following: (1) Code readers detected more faults than did those using the other techniques, while functional tester detected more faults than did structural testers; (2) Code readers had a higher fault detection rate than did those using the other methods, while there was no difference between functional testers and structural testers; (3) Subjects testing the abstract data type detected the most faults and had the highest fault detection rate, while individuals testing the database maintainer found the fewest faults and spent the most effort testing; (4) Subjects of intermediate and junior expertise were not different in number or percentage of faults found, fault detection rate, or fault detection effort; (5) subjects of advanced expertise found a greater number of faults than did the others, found a greater percentage of faults than did just those of junior expertise, and were not different from the others in either fault detection rate or effort; and (6) Code readers and functional testers both detected more omission faults and more control faults than

did structural testers, while code readers detected more interface faults than did those using the other methods. Author

N86-19970*# Maryland Univ., College Park.
SOFTWARE DEVELOPMENT IN Ada
Victor R. Basili and Elizabeth E. Katz *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1985 p 65-85 refs (For primary document see N86-19967 10-61)
(Contract N00014-82-C-0225)
Avail: NTIS HC A16/MF A01

Ada will soon become a part of systems developed for the US Department of Defense. NASA must determine whether it will become part of its environment and particularly whether it will become a part fo the space station development. However, there are several issues about Ada which should be considered before this decision is made. One means of considering these issues is the examination of other developments in Ada. Unfortunately, few full scale developments have been completed or made publicly available for observation. Therefore, it will probably be necessary to study an Ada development in a NASA environment. Another means related to the first is the development of Ada metrics which can be used to characterize and evaluate Ada developments. These metrics need not be confined to full scale developments and could be used to evaluate on going projects as well. An early development in Ada, some observations from that development, metrics which were developed for use with Ada, and future directions for research into the use of Ada in software development in general and in the NASA Goddard environment in particular are described. Author

N86-19971*# Virginia Univ., Charlottesville. Dept. of Computer Science.
A LARGE SCALE EXPERIMENT IN N-VERSION PROGRAMMING
John C. Knight and Nancy Leveson *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 86-99 (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

N-version programming has been proposed as a method of providing fault tolerance in software. The approach requires the independent preparation of several (i.e., N) versions of a piece of software for some application from the same requirements specifications. These versions are executed in parallel in the application environment; each receives identifical inputs and each produces its version of the required outputs. The outputs are collected by a voter and, in principle, they should all be the same. In practice there may be some disagreement. If this occurs, the results of the majority are assumed to be the correct output and this is the one used by the system. The great benefit that N-version programming is intended to provide is a substantial improvement in reliability. It is concluded that the assumption of independence does not hold. It is assumed in the analysis of the technique that the N different versions will fail independently; that is faults in the different versions occur at random and are unrelated. Author

N86-19972*# Maryland Univ., College Park. Dept. of Computer Science.
DESIGN METRICS FOR MAINTENANCE +
H. Dieter Rombach *In* NASA. Goddard Space Flight Center Nov. 1984 p 100-135 Sponsored in part by the Ministry of Research and Technology, Kalserlautern, West Germany (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

Results of a study to develop maintenance metrics based on structural software design characteristics are described. A characteristic metric set suited to explain and predict software maintenance behavior is defined. The maintenance aspects investigated are stability and modifiability. While stability addresses the average number of modules affected per change cause, modifiability characterizes the ease with which changes can be made within each of these modules. Additional interest is dedicated to the difference between characteristic design and implementation metric sets, and to the difference between change behavior during development and maintenance. The development of six software systems and controlled maintenance experiments using these system is examined. Author

N86-19973*# Illinois Univ., Urbana. Dept. of Computer Science.
AN APPROACH TO OPERATING SYSTEM TESTING
R. N. Sum, Jr., R. H. Campbell, and W. J. Kubitz *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 136-167 (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

To ensure the reliability and performance of a new system, it must be verified or validated in some manner. Currently, testing is the only resonable technique available for doing this. Part of this testing process is the high level system test. System testing is considered with respect to operating systems and in particular UNIX. This consideration results in the development and presentation of a good method for performing the system test. The method includes derivations from the system specifications and ideas for management of the system testing project. Results of applying the method to the IBM System/9000 XENIX operating system test and the development of a UNIX test suite are presented. Author

N86-19974*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE COGNITIVE CONNECTION: SOFTWARE MAINTENANCE AND DOCUMENTATION
Elliot Soloway (Yale Univ., New Haven, Conn.), Stan Letovsky, Beatrice Loerinc (Baruch College, New York, N.Y.), and Art Zygielbaum *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 168-177 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

With the goal of trying to understand what software maintainers do, talking aloud, video taped protocols with four expert maintainers were conducted as they were actively engaged in the process of enhancing a relatively small, interactive database program. The subjects exhibited a number of different types of information gathering strategies. Underlying these patterns of behavior, however, was the use of expectations about what should be seen in the program under examination. These expectations were generated on the basis of knowledge previously acquired as to the goals and programming plans that are typically employed in realizing interactive database programs. Thus, while the experts seemed to posses adequate programming knowledge, their actual code patches violated a basic principle of program structure. This failure by the programmers was attributed to ineffective program documentation. Suggestions for changes in the content of program documentation that should better facilitate software maintenance are presented. Author

N86-19975*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN EVALUATION OF PROGRAMMER/ANALYST WORKSTATIONS c60
K. Koerner (Computer Sciences Corp., Silver Spring, Md.), R. Mital (Computer Sciences Corp., Silver Spring, Md.), D. Card (Computer Sciences Corp., Silver Spring, Md.), and A. Maione *In its* Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 178-195 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

Very few automated tools were available to support software requirements analysis and design even though improvements in quality during these phases appear to offer the greatest leverage for improving the quality and productivity of the overall software development process. Recently, however, some such tools have appeared on the market. An industry survey, and an in-house evaluation of two commercial products by programmers and

analysts was undertaken to determine which tool is the best to support programmers and analysts through life cycle development. A tool was selected for full implementation on a project, where complete analysis of software statistics over the system life cycle will determine whether or not quality and productivity improvements have actually occurred. The results of the industry survey and in-house evaluation are summarized. Author

N86-19976*# IBM Federal Systems Center, Gaithersburg, Md. Advanced Technology Dept.
A MODEL FOR THE PREDICTION OF LATENT ERRORS USING DATA OBTAINED DURING THE DEVELOPMENT PROCESS
John E. Gaffney, Jr. and Steven J. Martello (IBM Corp., Kingston, N.Y.) *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 196-212 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

A model implemented in a program that runs on the IBM PC for estimating the latent (or post ship) content of a body of software upon its initial release to the user is presented. The model employs the count of errors discovered at one or more of the error discovery processes during development, such as a design inspection, as the input data for a process which provides estimates of the total life-time (injected) error content and of the latent (or post ship) error content--the errors remaining a delivery. The model presented presumes that these activities cover all of the opportunities during the software development process for error discovery (and removal). Author

N86-19977*# Virginia Polytechnic Inst., Blacksburg. Dept. of Computer Science.
THE INDEPENDENCE OF SOFTWARE METRICS TAKEN AT DIFFERENT LIFE-CYCLE STAGES
Dennis Kafura, James Canning, and Gereddy Reddy *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 213-230 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

Over the past few years a large number of software metrics have been proposed and, in varying degrees, a number of these metrics have been subjected to empirical validation which demonstrated the utility of the metrics in the software development process. Attempts to classify these metrics and to determine if the metrics in these different classes appear to be measuring distinct attributes of the software product are studied. Statistical analysis is used to determine the degree of relationship among the metrics. Author

N86-19978*# Naval Surface Weapons Center, Dahlgren, Va.
AN INTERACTIVE PROGRAM FOR SOFTWARE RELIABILITY MODELING c64
William H. Farr and Oliver D. Smith *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 231-263 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

With the tremendous growth in computer software, the demand has arisen for producing cost effective reliable software. Over the last 10 years an area of research has developed which attempts to address this problem by estimating a program's current reliability by modeling either the times between error detections or the error counts in past testing periods. A new tool for interactive software reliability analysis using the computer is described. This computer program allows the user to perform a complete reliability analysis using any of eight well-known models appearing in the literature. Some of the capabilities of the program are illustrated by means of an analysis of a set of simulated error data. Author

N86-19979*# Quantitative Software Management, Inc., McLean, Va.
ASSESSING THE PROFICIENCY OF SOFTWARE DEVELOPERS
Lawrence H. Putnam, Douglas T. Putnam, and Lauren P. Thayer *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 264-298 (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

The trend lines presented can be useful in a number of ways. They provide a baseline of comparision from which software developers can compare their performance against a large database of similar projects. This will often identify a organizational style. It was possible to quantify the organizational style using the Manpower Buildup Gradient. That the developer was a better than average producer on RAM based systems was shown. The Ck associated with the ROM system suggests that it is a different class of work. When this system is compared against the Firmware database it is very creditable. It is important to recognize that there are non linearities present in the software process. The non linearities are tied to system size. For comparative purposes one must always make judgements based on similar sizes. In the past the tendency has been to calculate a few ratios on several projects and then compare them without any regard to amount of functionality that was created. This practice can be very misleading and dangerous. The method described, used in a thoughtful analytic manner, can be very helpful. Author

N86-19980*# Intermetrics, Inc., Cambridge, Mass.
TAILORING A SOFTWARE PRODUCTION ENVIRONMENT FOR A LARGE PROJECT
David R. Levine *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 313-327 (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

A software production environment was constructed to meet the specific goals of a particular large programming project. These goals, the specific solutions as implemented, and the experiences on a project of over 100,000 lines of source code are discussed. The base development environment for this project was an ordinary PWB Unix (tm) system. Several important aspects of the development process required support not available in the existing tool set. Author

N86-19981*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANNOTATED BIBLIOGRAPHY OF SOFTWARE ENGINEERING LABORATORY LITERATURE
Nov. 1985 144 p
(NASA-TM-88588; NAS 1.15:88588; SEL-82-306) Avail: NTIS HC A07/MF A01 CSCL 09B

An annotated bibliography of technical papers, documents, and memorandums produced by or related to the Software Engineering Laboratory is presented. More than 100 publications are summarized. These publications are summarized. These publications cover many areas of software engineering and range from research reports to software documentation. This document has been updated and reorganized substantially since the original version (SEL-82-006, November 1982). All materials are grouped into five general subject areas for easy reference: (1) the software engineering laboratory; (2) software tools; (3) models and measures; (4) technology evaluations; and (5) data collection. An index further classifies these documents by specific topic. Author

N86-19982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Ada TRAINING EVALUATION AND RECOMMENDATIONS FROM THE GAMMA RAY OBSERVATORY Ada DEVELOPMENT TEAM
Oct. 1985 42 p refs
(NASA-TM-88593; NAS 1.15:88593; SEL-85-002) Avail: NTIS HC A03/MF A01 CSCL 09B

The Ada training experiences of the Gamma Ray Observatory Ada development team are related, and recommendations are made concerning future Ada training for software developers. Training methods are evaluated, deficiencies in the training program are noted, and a recommended approach, including course outline, time allocation, and reference materials, is offered. E.A.K.

N86-19983*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INVESTIGATION OF SPECIFICATION MEASURES FOR THE SOFTWARE ENGINEERING LABORATORY (SEL)
Dec. 1984 74 p refs
(NASA-TM-88591; NAS 1.15:88591; SEL-84-003) Avail: NTIS HC A04/MF A01 CSCL 09B

Requirements specification measures are investigated for potential application in the Software Engineering Laboratory. Eighty-seven candidate measures are defined; sixteen are recommended for use. Most measures are derived from a new representation, the Composite Specification Model, which is introduced. The results of extracting the specification measures from the requirements of a real system are described. Author

N86-19984# North Carolina State Univ., Raleigh. Dept. of Industrial Engineering.
A NOTE ON LINEAR PROGRAMMING AND THE SINGLE MACHINE LOTSIZE SCHEDULING PROBLEM. REVISION
T. J. Hodgson and H. L. W. Nuttle Jun. 1985 11 p
(Contract N00014-84-K-0046)
(AD-A159683; AD-E801193; NUSC-TR-85-1-REV) Avail: NTIS HC A02/MF A01 CSCL 12/1

Past research on the lotsize scheduling problem has relied heavily on the following assumptions: (1) each product is to be produced on a regular invariant cycle, and (2) the inventory level at the onset of each production run is zero. In this paper these two restrictions have been dropped. It is shown that the inventory cost function can be expressed as a linear function. This allows the use of linear programming methods to determine the optimal lengths for a given sequence of production runs. Author (GRA)

N86-19985# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
ADAPTIVE HYBRID PICTURE CODING. VOLUME 2 Final Report, 1 Oct. 1983 - 30 Sep. 1984
R. A. Jones, C. D. Bowling, and Y. J. Tejwani 1 Feb. 1985 184 p
(Grant AF-AFOSR-0351-82)
(AD-A160317; AFOSR-85-0922TR-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 09/4

A system for the machine recognition of partial shapes is described. Shape analysis methods are reviewed in context to the problem of machine recognition of partial shapes, and their limitations. The problem of defining the critical points for shapes and partial shapes with various degrees of curvature is considered. It is shown that the critical points derived using criteria based on curvature alone are insufficient to describe shapes represented by smooth curves. A new method of shape analysis is described which exhibits superior performance over the critical point detection methods based on curvature alone. The critical points determined by this method are based on a set of coordinate axes that are dependent on the shape itself. This guarantees that the critical points detected are independent of size, rotation, and displacement of the shape. The results of applying this new procedure to actual shapes are demonstrated and discussed. GRA

N86-19986# Naval Ocean Systems Center, San Diego, Calif.
KAPSE (KERNEL Ada PROGRAMMING SUPPORT ENVIRONMENT) INTERFACE TEAM PUBLIC REPORT. VOLUME 5 Final Report, Jul. 1984 - Aug. 1985
P. A. Oberndorf Aug. 1985 338 p
(AD-A160355; NOSC/TD-552-Vol-5) Avail: NTIS HC A15/MF A01 CSCL 09/2

This report gives the minutes of the April 1984, the July 1984, and the October 1984 KAPSE Interface Team. The report also includes the details of the Second CAIS Review Meeting, August 1984. GRA

N86-19987# Rutgers - The State Univ., New Brunswick, N. J. Lab. for Computer Science Research.
THE USE OF CK-LOG FORMALISM FOR KNOWLEDGE REPRESENTATION AND PROBLEM SOLVING IN OPPLAN-CONSULTANT: AN EXPERT SYSTEM FOR NAVAL OPERATIONAL PLANNING Interim Report, 1982 - 1984
C. V. Srinivasan 30 Sep. 1985 112 p
(Contract N00014-82-C-2126)
(AD-A160999; NRL-8902) Avail: NTIS HC A06/MF A01 CSCL 09/2

The principal concepts in the organization and operation of the logic-based knowledge processing system, called CK-LOG (A Calculus for Knowledge in LOGic) are introduced. CK-LOG uses the frame-based system MDS (the Meta Description System) for knowledge representation and for modelling world states. It uses an inference engine based on natural Deduction for stating and solving problems. The operation of CK-LOG is discussed here in the context fo OPPLAN-CONSULTANT, an expert consultation system for Naval Operational Planning that is now being designed using the CK-LOG formalism. CK-LOG itself is currently under implementation. The descriptive adequacy of CK-LOG to state and represent military planning knowledge needed for operational planning is established, as well as its problem solving adequacy to use this knowledge automatically to help military commanders design operational plans to achieve given military objectives. The various features of CK-LOG are described in this report. Author

N86-19988# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A USER'S MANUAL FOR THE FIT PROGRAM: A MODEL FOR SMOOTHING RAW DATA Memorandum Report
Denice M. Petro Oct. 1985 31 p
(DA Proj. 1L1-62618-AH-80)
(AD-A161035; BRL-MR-3472) Avail: NTIS HC A03/MF A01 CSCL 12/1

FIT is a FORTRAN 77 program which fits a smooth curve to raw data. The program finds the trends inherent in the data (the peaks, valleys, slopes, etc.) and produces a set of modified data points, which can be plotted using any available graphics package. It is easily used without much knowledge of the underlying techniques and can be employed repeatedly to the subsequent smoothed data sets to achieve any smoothness desired. However, some care must be taken, since the input data must be equally spaced in the independent variable with only a few missing data points. This report covers input preparation, output expectation, technique explanation and provides a program listing in the appendix. GRA

N86-19989# Measurement Concept Corp., Rome, N. Y.
SOFTWARE CONVERSION OF STANDARD LINEAR FORMAT (SLF) TO STANDARD INTERCHANGE FORMAT (SIF) Final Technical Report, Sep. 1983 - Jul. 1985
Kathryn J. Sands and Kim D. Headlee Jul. 1985 152 p
(Contract DAAK70-83-C-0174)
(AD-A161086; ETL-0394) Avail: NTIS HC A08/MF A01 CSCL 08/2

Software accepts a digital cartographic data set in DMA Standard Linear Format as input and generates graphics and attribute data base information in Intergraph Corporation Standard Interchange Format. Cartographic feature information is examined to derive graphic symbolization characteristics. Validation of inputs ensures the quality of the output. Additional software provides the capability to convert from Intergraph Standard Interchange Format to DMA Standard Linear Format. This report describes the capabilities, logical flow and components of the Conversion Software. The final section presents conclusions regarding performance and limitations and recommends areas for further investigation. The Users Manual, Program Maintenance Manual and Message Definition Document are included as Appendices. GRA

N86-19990# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
CHECKPOINTING AND ROLLBACK-RECOVERY FOR DISTRIBUTED SYSTEMS
Richard Koo and Sam Toueg Oct. 1985 26 p
(Contract MDA903-85-C-0124; Grants NSF DCR-84-12582; NSF

MCS-83-03135; ARPA Order 5378)
(AD-A161126; CU-CSD-TR-85-706) Avail: NTIS HC A03/MF A01 CSCL 09/2

We consider the problem of bringing a distributed system to a consistent state after transient failures. We address the two components of this problem by describing a distributed algorithm to create consistent checkpoints, as well as a rollback-recovery algorithm to recover the system to a consistent state. In contrast to previous algorithms, they tolerate failures that occur during their executions. Furthermore, when a process takes a checkpoint, a minimal number of additional processes are forced to take checkpoints. Similarly, when a process restarts after a failure, a minimal number of additional processes are forced to restart with it. Our algorithms require each process to store at most two checkpoints in stable storage. This storage requirement is shown to be minimal under general assumptions. GRA

N86-19991# Naval Postgraduate School, Monterey, Calif.
SOFTWARE COST ESTIMATION THROUGH BAYESIAN INFERENCE OF SOFTWARE SIZE M.S. Thesis
In K. Park Sep. 1985 71 p
(AD-A161184) Avail: NTIS HC A04/MF A01 CSCL 09/2

It s important for the program manager to understand the software life-cycle and development process. Multiple models of the life-cycle are examined and compared with the DOD software lifecycle. The Rayleigh equation and the resulting difficulty gradient equation of the SLIM software model are very powerful techniques for estimating development time, effort, and cost. To estimate the size f the new project a Bayesian inference technique, is proposed. This technique is then applied using the SLIM model and the QSM data base. GRA

N86-19992# Naval Postgraduate School, Monterey, Calif.
MINIMIZING FILL-IN FOR GAUSSIAN ELIMINATION OF SYMMETRIC SYSTEMS M.S. Thesis
Young H. Seo Sep. 1985 34 p
(AD-A161196) Avail: NTIS HC A03/MF A01 CSCL 12/1

The new projective linear programming algorithm by Karmarkar requires solution of symmetric, positive definite systems of equations. One key to solving these systems efficiently is minimizing the fill-in; i.e., the number of new nonzero elements in the reduced matrix, in the various forms of Gaussian elimination used to solve these systems. Fill-in is affected only by symmetric reordering of rows and columns of the system of equations. Various heuristic ordering algorithms are tested and compared with the heuristic minimum degree algorithm of George and Liu. Computational results are reported for 16 large-scale real-world and artificial problems. The minimum degree algorithm of George and Liu is the most effective of six tested methods. Author (GRA)

N86-19993# Naval Postgraduate School, Monterey, Calif.
COMPUTER AIDED INSTRUCTION DESIGN ISSUES: THE DEVELOPMENT OF A PORTABLE MICROCOMPUTER-BASED CAI (COMPUTER ASSISTED INSTRUCTION) FOR STATISTICS INSTRUCTION M.S. Thesis
Randall L. Henderson Sep. 1985 293 p
(AD-A161211) Avail: NTIS HC A13/MF A01 CSCL 12/1

The primary focus of this thesis is the development of a portable microcomputer-based software package to aid in the instruction of a graduate level introductory statistics course. In order to accomplish this objective, an exploration of various conventional Computer Assisted Instruction (CAI) techniques is necessary to determine which methods are readily adaptable for use with portable microcomputers. Many of the design issues normally associated with the development of CAI packages are exasperated by the current physical limitations of portable microcomputers. This thesis will discuss general CAI design issues and related compromises and trade-offs needed to successfully implement some of these designs in a portable microcomputer-based system. A systematic methodology for designing simple paired-associate learning (Drill and Practice) software is presented, which incorporates many of the lessons learned in the development of the included statistics software package. Author (GRA)

N86-19994# Netherlands Energy Research Foundation, Petten.
USER-FRIENDLY APPLICATION OF THE RT-11 OPERATING SYSTEM IN MINICOMPUTER INSTRUMENT CONTROL
R. B. Helmholdt Jan. 1985 32 p refs
(ECN-163; B8561164) Avail: NTIS HC A03/MF A01

A software system to control a powder neutron diffractometer at an experimental nuclear reactor was designed. The system is completely transparent to the experimenter and allows access at nearly any time. The system configuration (hardware and software) and the requirements which define a transparent system are described. The requirements involve communication between the different parts of the system to establish the current or previous status. This status is defined by flags or files on floppy disk. Implementation of the condition to interrupt a running system in a soft way at nearly any moment, which requires that the console is listening, is outlined. The system is applicable to any other instrument as long as the same operating system is used. Author (ESA)

N86-19995# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
MANUAL FOR THE USE OF THE COMMON COMMAND LANGUAGE WITH A DARIUS COMMAND [HANDLEIDING VOOR HET GEBRUIK VAN DE COMMON COMMAND LANGUAGE BIJ EEN DARIUS-DATABANK]
Hans Bakker May 1984 24 p In DUTCH
(IWIS-C-84-AU-32) Avail: NTIS HC A03/MF A01

The DARIUS command language based on the Common Command Language (CCL) was developed to command a DARIUS databank. The CCL vocabulary was partly adopted; TYPE and METHOD elements were added. Searching with standardized command languages is possible. Author (ESA)

N86-19996# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
INTERACTIVE GOAL PROGRAMMING: A MULTICRITERIA DECISION METHOD [INTERACTIEVE DOEL PROGRAMMERING: EEN MULTICRITERIA BESLISSINGSMETHODE]
R. A. A. M. Geilleit Jan. 1984 37 p refs In DUTCH
(IWIS-A-84-TW-01) Avail: NTIS HC A03/MF A01

A continuous decision-making method in which the decision-maker can state his preferences during the solving process is described. The method was implemented on a linear model with 7 goal variables, > 1000 instrument variables, and > 1000 hard restrictions. In an iterative proces with the decision maker, the set of desired alternatives is limited by minimizing the goal restrictions or optimizing the instrument (as a function of the goal) variables. A manual and example are presented. Author (ESA)

N86-19997# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
DATA BASE MANAGEMENT ADMINISTOR FACILITIES FOR ENGINEERING DATA MANAGEMENT
H. Steenbergen and F. J. Heerema 5 Feb. 1985 25 p refs Presented at 4th International Conference on Engineering Software ENGSOFT 85, London, England, 18-20 Jun. 1985
(NLR-MP-85010-U; B8571445) Avail: NTIS HC A02/MF A01

Engineering data base administration and the requirements for the facilities to support this task are discussed using the facilities for database administration in the Engineering Data Interactive Presentation and Analaysis System (EDIPAS). This system provides a standard framework for the data management and the data evaluation and presentation tasks for a variety of engineering applications. It provides data base administrator facilities to create a database, to inspect and to maintain the contents of the database, including the chosen user's views on the data as stored in the base. Author (ESA)

N86-19630# Lehigh Univ., Bethlehem, Pa. Inst. for Robotics.
ROBOT SOFTWARE: CURRENT STATE-OF-THE-ART, AND FUTURE CHALLENGES
Roger N. Nagel and Scott R. Garrigan *in* AGARD Artificial Intelligence and Robotics Sep. 1985 9 p (For primary document

see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N86-19998*# Research Triangle Inst., Research Triangle Park, N.C.
ADAMS: AIRLAB DATA MANAGEMENT SYSTEM USER'S GUIDE
C. L. Conrad, W. F. Ingogly, and L. A. Lauterbach Feb. 1986 162 p
(Contract NAS1-16489)
(NASA-CR-177975; NAS 1.26:177975) Avail: NTIS HC A08/MF A01 CSCL 09B

The AIRLAB Data Management System (ADAMS) is an online environment that supports research at NASA's AIRLAB. ADAMS provides an easy to use interactive interface that eases the task of documenting and managing information about experiments and improves communication among project members. Data managed by ADAMS includes information about experiments, data sets produced, software and hardware available in AIRLAB as well as that used in a particular experiment, and an on-line engineer's notebook. The User's Guide provides an overview of the ADAMS system as well as details of the operations available within ADAMS. A tutorial section takes the user step-by-step through a typical ADAMS session. ADAMS runs under the VAX/VMS operating system and uses the ORACLE database management system and DEC/FMS (the Forms Management System). ADAMS can be run from any VAX connected via DECnet to the ORACLE host VAX. The ADAMS system is designed for simplicity, so interactions within the underlying data management system and communications network are hidden from the user. Author

N86-19999# Naval Postgraduate School, Monterey, Calif.
STRATEGIC PERFORMANCE MANAGEMENT EVALUATION FOR THE NAVY'S SPLICE LOCAL AREA NETWORKS M.S. Thesis
D. D. Blankenship Apr. 1985 139 p
(AD-A161198) Avail: NTIS HC A07/MF A01 CSCL 09/2

Computational fluid dynamics as a research area has attracted mathematicians not only because of its importance to the engineering community, but also because of the pitfalls that are encountered in solving various discretizations of the governing Navier-Stokes equations. Such pitfalls are highlighted in this paper along with methods to circumvent them. Discretizations of the Navier-Stokes equations often can be viewed as systems defining flows on an associated network. This observation provides a means of economizing on their numerical solution. Author (GRA)

N86-20000# Naval Postgraduate School, Monterey, Calif.
ISSUES IN MANAGING THE MICROCOMPUTER INFORMATION RESOURCES IN THE NAVAL AVIATION COMMUNITY M.S. Thesis
Richard P. Halter Sep. 1985 83 p
(AD-A161207) Avail: NTIS HC A05/MF A01 CSCL 09/2

The proliferation of microcomputer systems within Naval Aviation organizations in this decade has forced managers to rethink the role of information production. This thesis addresses the interaction of the organization process on information production, which Navy managers must be aware of in order to perform their job. The role of information management is examined to allow management to use existing microcomputer information systems capabilities more effectively. Discussion includes the impact of microcomputers systems on the flow of information, and microcomputer assistance to management in planning, program solving, and decision making. Research findings indicate that management of microcomputers has increased the actual time and cost of information flow within organization units. Security of classified materials processed on microcomputers and training of user skills are deficient. Organizations need to incorporate a specialized computer manager. GRA

N86-20001# Naval Postgraduate School, Monterey, Calif.
MICROCOMPUTER MANAGEMENT POLICY FOR US NAVAL FORCES M.S. Thesis
Donald S. Free Sep. 1985 64 p
(AD-A161208) Avail: NTIS HC A04/MF A01 CSCL 09/2

Microcomputers have become an integral part of business life in America and in the U.S. Navy. They can be used as stand-alone processors, components of a network, or terminals to more powerful mini or mainframe computers. Microcomputers are a valuable resource and should be treated accordingly. The proliferation of microcomputers can not go unchecked by management. There must be a plan that will channel the power of microcomputer towards the goals and objectives of the organization. The Navy is no exception. It too must deal with the proliferation of a new technology. The Navy must establish hardware and software standards for use throughout the fleet. These standards must be incorporated in fleetwide training plans so that fleet personnel can apply the standards in the accomplishment of their tasks. Through a comprehensive microcomputer management policy, the power of microcomputers can be used to accomplish the Navy's mission. GRA

N86-20002# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
COMPUTER-AIDED FABRICATION SYSTEM IMPLEMENTATION Semiannual Technical Report, 1 Apr. - 30 Sep. 1985
Paul Penfield, Jr., Stanley B. Gershwin, Dimitri A. Antoniadis, and Donald E. Troxel 30 Sep. 1985 20 p
(Contract N00014-85-K-0213)
(AD-A161244) Avail: NTIS HC A02/MF A01 CSCL 09/2

The implication of completed aided fabrication systems is outlined. The following topics are included: research overview; scheduling; modular process; CAF system structure; publication list; dynamic production scheduling in computer-aided fabrication; MASTIF - a workstation approach to fabrication process design. GRA

N86-20003# Mitre Corp., McLean, Va.
RADICAL COMPUTING 3
Saul Amarel, Curtis G. Callan, Jr., Roger F. Dashen, Alvin M. Despain, and Oscar S. Rothaus Sep. 1985 69 p
(Contract F19628-84-C-0001)
(AD-A161249; JSR-84-701) Avail: NTIS HC A04/MF A01 CSCL 09/2

We explore two topics suggested from the last study. The first is Molecular Computing which may offer a technology that could realize some the ideas of reversible computing. The second topic is the Theory of Transformation of Weak Methods into Strong Methods. This is a direct extension of our prior Source Program Transformation work. Since the goal of this and all our previous work is to identify potential new development, the ideas discussed herein are quite speculative and should be considered with some caution. We limit our investigation to improvements in computer performance in the execution of only difficult calculations. We will not seek higher performance in the execution of only difficult calculations. We will not seek higher performance for problems easily managed by today's machines. GRA

N86-20004# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION AND IMPLEMENTATION STUDY OF THE ZENITH 120 MICROCOMPUTER IN WEST COAST FLEET COMMANDS M.S. Thesis
George A. Barnett Sep. 1985 102 p
(AD-A161254) Avail: NTIS HC A06/MF A01 CSCL 09/2

Austere funding and the increased administrative burdens being placed on Fleet units will ultimately take their toll on performance, morale, and combat readiness. Applying low cost microcomputer technology presents one method to alleviate many of thees burdens. However, the current implementation process being used is not sufficient to meet the needs of the Fleet. Empirical

evidence indicates that expenditures on computers are not accompanied by the expected rise in productivity. The use of microcomputers is feasible. They are being used successfully throughout both the civilian and military communities. This study discusses the environment necessary to meet user needs. The central theme is one of standardization and documentation. Necessary tools and general recommendations are discussed. GRA

N86-20005# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
FLEXIBLE AND DYNAMIC DATA MODELING ASPECTS OF THE ENGINEERING DATA MANAGEMENT SYSTEM ENGINEERING DATA INTERACTIVE PRESENTATION AND ANALYSIS SYSTEM (EDIPAS)
H. A. Kreijkamp, H. vanHedel, and F. J. Heerema 20 Mar. 1985 24 p refs Presented at International Congress Intelligence 85, Paris, France, 21-24 May 1985
(NLR-MP-85026-U; B8571446) Avail: NTIS HC A03/MF A01

The data model required for data management facilities used in engineering is discussed. As engineering activities are mulitdisciplinary by nature, the model must be flexible. The data model has to offer the possibilities to change the data organization in an existing data base dynamically in accordance with the view of the user. The Engineering Data Interactive Presentation and Analysis System meets the requirements of and supports the management and the evaluation of engineering data. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N86-20006# Air Force Armament Lab., Eglin AFB, Fla.
MELLIN-FOURIER CORRELATION Final Technical Report, Jun. 1982 - Jan. 1984
E. C. Friday Aug. 1985 53 p
(AF Proj. 230-5)
(AD-A159685; AD-E801193; AFATL-TR-85-53) Avail: NTIS HC A04/MF A01 CSCL 05/8

This program evaluates the success of a pattern recognition system which attempts to recognize an object even though the object differs in size and orientation from the object used as a reference. The criteria for recognition were the peak value and shape of the cross correlation function calculated in two dimensions. The cross correlation was performed using Fourier transform techniques to judge the utility of implementing the system using many standards optical components. Size, or scale, invariance was achieved using a logarithmic sampling technique (the Mellin transform), and variations on traditional sampling methods were shown to extend the scale invariance predicted by various researchers. The utility of the sampling techniques developed was proven using images acquired from infrared sensors carried aboard helicopters. Limits of practical scale invariance were explored and system design approaches were suggested from the results of numerical experiments carried out in computer simulations. GRA

N86-20007# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
OPTIMAL BAYESIAN ESTIMATORS FOR IMAGE SEGMENTATION AND SURFACE RECONSTRUCTION
J. L. Marroquin Apr. 1985 19 p
(Contracts N00014-80-C-0505; DAAG29-84-K-0005)
(AD-A159692; AI-M-839) Avail: NTIS HC A02/MF A01 CSCL 12/1

A very fruitful approach to the solution of image segmentation and surface reconstruction tasks is their formulation as estimation problems via the use of Markov random field models and Bayes theory. However, the Maximum a Posteriori estimate, which is the one most frequently used, is suboptimal in these cases. The author shows that for segmentation problems, the optimal Bayesian estimator is the maximizer of the posterior marginals, while for reconstruction tasks, the thresholded posterior mean has the best possible performance. He presents efficient distributed algorithms for approximating these estimates in the general case. Based on these results, developed is a maximum likelihood procedure that leads to a parameter-free distributed algorithm for restoring piecewise constant images. To illustrate these ideas, the reconstruction of binary patterns is discussed in detail. Author (GRA)

N86-20008# Honeywell Systems and Research Center, Minneapolis, Minn.
HIERARCHICAL MULTISENSOR IMAGE UNDERSTANDING Final Report, Oct. 1983 - Aug. 1985
R. K. Aggarwal, M. Bazakos, J. Budenske, Y. Kim, and S. Mader Aug. 1985 129 p
(Contract F49620-83-C-0134)
(AD-A160324; AFOSR-85-0801TR) Avail: NTIS HC A07/MF A01 CSCL 12/1

This report describes the research results on Honeywell's Hierarchical Multisensor Image Understanding program. Honeywell is developing a unified framework for the different hierarchical levels of image processing such as segmentation, detection, classification, and identification of outdoor scenes and across different sensor modalities such as millimeter wave, infrared, and visible. Current activities on the project are reviewed under the following headings: (1) A Survey of Multisource Information Fusion Systems; (2) The Role of Structure in Human and Machine Perception; (3) A Knowledge Based Image Segmentation System; (4) The Use of Optical Flow as a Depth Cue in Scene Analysis; and (5) Belief Maintenance for A Fuzzy Reasoning System. GRA

N86-20009# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ANALYSIS OF PREPROCESSORS AND DECISION AIDS IN ORGANIZATIONS Technical Report
G. H. L. Chyen and A. H. Levis Feb. 1985 8 p
(Grant AF-AFOSR-0229-80)
(AD-A160325; LIDS-P-1438; AFOSR-85-0819TR) Avail: NTIS HC A02/MF A01 CSCL 05/1

The use of preprocessors and decision aids in command, control and communication (C3) systems is meant to reduce the workload of individual decisionmakers and improve the quality of an organization's decisionmaking. An information theoretic framework is used to model the decision aids. Thus, it becomes possible to evalaute quantitatively the effect a decision aid has on the workload of a decisionmaker and to derive necessary conditions that preprocessors (a generic form of decision aids) must satisfy in order that they reduce the human's workload. GRA

N86-20010# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical and Computer Engineering.
MULTI-DISCIPLINARY TECHNIQUES FOR UNDERSTANDING TIME-VARYING SPACE-BASED-IMAGERY Annual Report, May 1984 - May 1985
D. Casasent, A. Sanderson, and T. Kanade 10 May 1985 136 p
(Contract F49620-83-C-0100)
(AD-A160334; AFOSR-85-0818TR) Avail: NTIS HC A07/MF A01 CSCL 20/6

This project is a multidisciplinary effort between 3 departments and principal investigators. It intends to combine: pattern recognition, image understanding and artificial intelligence techniques for space-based image processing as well as: optical and digital processing methods. Optical feature extraction and sub-pixel target detection and tracking results are summarized. Scene representation and modeling work using: probabilistic graph matching, multiple resolution rotation-invariant operators and texture analysis are detailed. Image understanding techniques for 3D scene interpretation discussed include 2D image-level methods (using features such as edges, lines and corners) and 3D scene-level methods. New dynamic programming, stereo image and model building results are included. Author (GRA)

N86-20011# Pennsylvania State Univ., University Park. Dept. of Statistics.
AFFINE INVARIANT RANK METHODS IN THE BIVARIATE LOCATION MODEL
B. M. Brown and T. P. Hettmansperger Sep. 1985 23 p
(Contract N00014-80-C-0741)
(AD-A160341; TR-58) Avail: NTIS HC A02/MF A01 CSCL 12/1

The generalized multivariate median of H. Oja is used to define a multivariate notion of quantile, or rank, and to define a measure of scatter of multivariate linear models. The latter, when applied to the one- and two-sample bivariate location models, yields affine invariant analogs of the Wilcoxon rank-sum and signed-rank tests, and of the corresponding estimates. Author (GRA)

N86-20012# Colorado State Univ., Fort Collins. Dept. of Statistics.
MULTIVARIABLE PROBLEMS OF STATISTICS AND PROBLEM THEORY Annual Report, Apr. 1984 - Apr. 1985
J. Srivastava 23 May 1985 4 p
(Grant AF-AFOSR-0080-83)
(AD-A160347; Rept-03-2516; AFOSR-85-0771TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During 1984 to 1985 two papers were published, two were submitted and three are in process. Work in Reliability, Multivariate Analysis and Information Theory continued. Additional
Author (GRA)

N86-20013# MacAulay-Brown, Inc., Fairborn, Ohio.
AUTOMATION AND THE ALLOCATION OF FUNCTIONS BETWEEN HUMAN AND AUTOMATIC CONTROL: GENERAL METHOD
Robert Pulliam and H. E. Price Jan. 1985 106 p Prepared in cooperation with Essex Corp., Alexandria, Va.
(Contract F33615-82-C-0513)
(AD-A161072; AFAMRL-TR-85-017) Avail: NTIS HC A06/MF A01 CSCL 05/8

This report was prepared as a Human Engineering Data Base Supplement to the Integrated Perceptual Information for Designers (IPID) Engineering Data Compendium. It describes a general method for allocation of functions during systems development, with particular focus on what functions should be automatic. The method was originally developed for use in the nuclear power industry, and has here been redeveloped for use in aerospace systems. The report is intended for use of project managers, systems engineers and system designers, as an applied guide during the development of aerospace systems. It provides a detailed procedure for allocation of functions (AOF), a procedure to be applied during the research, development, test and evaluation (RDT&E) process. The report uses a hierarchical structure in which each of five sections treats the AOF process at an increasing level of detail, as follows: section 1 concerns how to use the report; section 2 describes the RDT&E process in terms of the cyclic decision and test steps by which design proceeds, and identifies those steps which are critical to a successful AOF; section 3 focuses on one critical step in RDT&E, the formation of design hypotheses, and describes that step in greater detail; section 4 focuses even more narrowly on a step within design hypothesis, and identifies four sets of criteria which should be applied in sequence to assist AOF decisions; finally, section 5 identifies human-machine models by which aerospace systems can be analyzed during systems design. GRA

N86-20014# IIT Research Inst., Chicago, Ill. Manufacturing Technology Information Analysis Center.
ARTIFICIAL INTELLIGENCE APPLICATIONS IN MANUFACTURING
Raymond H. Cook Oct. 1985 59 p
(Contract DLA900-84-C-1508)
(AD-A161161; MTIAC-TA-85-01) Avail: NTIS HC A04/MF A01 CSCL 09/2

Developments in the field of artificial intelligence hold great promise for applications in the factory of the future. However, the technology and applications are still in an early stage of emergence. The literature of the last few years has been surveyed to develop a profile of the state of this emergence. This, coupled with interviews with workers heavily involved in the application of AI, shows that within the AI family of technologies expert systems dominate current applications. The next year promises to be very active as true production expert systems begin to appear. This won't be without problems, however. Several references are recommended for initial reading in AI, and lists of products, programs, and players in the field are included. Author (GRA)

N86-19634# Royal Signals and Radar Establishment, Malvern (England). Integrated Air Defence Systems Div.
APPLICATIONS OF EXPERT SYSTEMS
Philip R. Wetherall *In* AGARD Artificial Intelligence and Robotics Sep. 1985 17 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

N86-19635# George Mason Univ., Fairfax, Va.
APPLYING AI TO THE DIAGNOSIS OF COMPLEX SYSTEM FAILURES
Kenneth DeJong *In* AGARD Artificial Intelligence and Robotics Sep. 1985 4 p refs (For primary document see N86-19627 10-37)
Avail: NTIS HC A07/MF A01

N86-20084# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE TRAJECTORY SENSITIVITY OF ADAPTIVE STOCHASTIC CONTROL SYSTEMS Abstract Only
A. I. Petrov, A. G. Zubov, and V. V. Minin *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 89 Transl. into ENGLISH from Avtomatika (Kiev, USSR), no. 2, Mar. - Apr. 1985 p 51-59 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N86-20015 Suomalainen Tiedeakatemia, Helsinki (Finland). Dept. of Mathematics.
UPPER DENSITY PROPERTIES OF HAUSDORFF MEASURES ON FRACTALS Thesis
Arto Salli and Olli Lehto, ed. 1985 53 p refs
(ISSN-0355-0087; ISBN-951-41-0478-1) Copyright. Avail: Issuing Activity

Let n be a positive integer, R sup n the Euclidean n-space, 0 < or = s < or = n and H sup s the non-normalized s-dimensional Hausdorff outer measure over R sup N. Fix a set (E is a subset of R sup n) such that H sup s (E) < infinity. If the topological dimension of E is smaller than its Hausdorff dimension dim (E), then E is called a fractal. This study is focused on the measure-theoretical density properties of fractals. M.G.

N86-20016# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
ADAPTIVE REFINEMENT METHODS FOR NONLINEAR PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS Interim Report
M. Bietermman, J. E. Flaherty, and P. K. Moore Dec. 1984 35 p Prepared in cooperation with Boeing Computer Services, Tukwila, Wash.
(Grant AF-AFOSR-0192-80)
(AD-A160314; AFOSR-85-0827TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document considers two adaptive finite element techniques for parabolic partial differential equations (PDEs) that are based on using error estimates to control mesh refinement. One technique is a method of lines approach that uses a Galerkin method to discretize the PDEs in space and implicit multi-step

integration in time. Spatial elements are added and deleted in regions of high and low error and are all advanced with the same sequence of varying time steps. The second technique is a local refinement method that uses Galerkin approximations in both space and time. Fine grids of space-time elements are added to coarser grids and the problem is recursively solved in regions of high error. Author (GRA)

N86-20017# Wisconsin Univ., Madison. Mathematics Research Center.
LIPSCHITZ CONTINUITY OF SOLUTIONS OF LINEAR INEQUALITIES, PROGRAMS AND COMPLEMENTARITY PROBLEMS Technical Summary Report
O. L. Mangasarian and T. H. Shiau Jul. 1985 30 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-82-10950)
(AD-A160957; MRC-TSR-2838) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is shown that solutions of linear inequalities, linear programs and certain linear complementarity problems (e.g., those with P-matrices or Z-matrices but not semidefinite matrices) are Lipschitz continuous with respect to changes in the right hand side data of the problem. Solutions of linear programs are not Lipschitz continuous with respect to the coefficients of the objective function. The Lipschitz constant given here is a generalization of the role played by the norm of the inverse of a nonsingular matrix in bounding the perturbation of the solution of a system of equations in terms of a right hand side perturbation. Author (GRA)

N86-20018# Wisconsin Univ., Madison. Mathematics Research Center.
ERROR BOUNDS FOR NEWTON'S ITERATES DERIVED FROM THE KANTOROVICH THEOREM Technical Summary Report
Tetsuro Yamamoto Jul. 1985 17 p
(Contract DAAG29-80-C-0041)
(AD-A160959; MRC-TSR-2843) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, it is shown that the upper and lower bounds of the errors in the Newton iterates recently obtained by Potra-Ptak and Miel, with the use of nondiscrete induction and majorizing sequence, respectively, follow immediately from the Kantorovich theorem and the Kantorovich recurrence relations. It is also shown that the upper and lower bounds of Miel are sharper than those of Potra-Ptak. GRA

N86-20019# Wisconsin Univ., Madison. Mathematics Research Center.
A NOTE ON LEAST TWO NORM SOLUTIONS OF MONOTONE COMPLEMENTARITY PROBLEMS Technical Summary Report
P. K. Subramanian Jul. 1985 18 p
(Contract DAAG29-80-C-0041; Grants NSF DCR-84-20963; NSF MCS-81-02648)
(AD-A160961; MRC-TSR-2844) Avail: NTIS HC A02/MF A01 CSCL 12/1

For the monotone nonlinear complementarity problem, this document considers Tihonov regularizations which reduce the solution of the problem to the solution of a sequence of strongly monotone complementarity problems. The sequence of solutions obtained are called aproximate solutions and it is known that for a soluable monotone complementarity problem, the approximate solutions converge to the least two norm solution of the given problem. This paper provides new growth rates for these approximate solutions, sharpens some previously known results and gives a computational procedure for obtaining an approximate solution for any apriori prescribed tolerance. Author (GRA)

N86-20020# Wisconsin Univ., Madison. Mathematics Research Center.
A CLASS OF ONE-DIMENSIONAL DEGENERATE PARABOLIC EQUATIONS Technical Summary Report
John A. Nohel Jul. 1985 20 p
(Contract DAAG29-80-C-0041)
(AD-A160962; MRC-TSR-2837) Avail: NTIS HC A02/MF A01 CSCL 12/1

Degenerate parabolic equations arise in the description of melting processes, gas dynamics and certain biological models. The interfaces corresponding to degeneracies in the constitutive function usually separate different media in the physical problem. Problem (P) stated in the abstract is related to nonlinear diffusion equations with nonmonotone constitutive functions as has been discussed in previous documents. This report obtains explicit self-similar solutions for (P) corresponding to a class of model initial data and for determining the free boundary explicitly. The qualitative behavior of these solutions, in particular of their interfaces, is typical of the situation in more general problems. For general initial data, the author then uses these self-similar solutions as comparison functions to study the regularity and the behavior of the free boundary for small time. GRA

N86-20021# Wisconsin Univ., Madison. Mathematics Research Center.
ERROR BOUNDS FOR MONOTONE LINEAR COMPLEMENTARITY PROBLEMS Technical Summary Report
O. L. Mangasarian and T. H. Shiau Sep. 1985 14 p
(Contract DAAG29-80-C-0041; Grant NSF DCR-84-20963)
(AD-A160975; MRC-TSR-2862) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors give a bound on the distance between an arbitrary point and the solution set of a monotone linear complementarity problem in terms of a condition constant which depends on the problem data only and a residual function of the violations of the complementarity problem conditions by the point considered. When the point satisfies the linear inequalities of the complementarity problem, the residual consists of the complementarity condition $x(Mx + q)$ plus its square root: $(x(Mx + q))$ to the 1/2 power. This latter term is essential and without which the error bound cannot hold. It is also shown that another natural residual that has been employed to bound errors for strictly monotone linear complementarity problems, fails to bound errors for the monotone case considered here. Author (GRA)

N86-20022# Wisconsin Univ., Madison. Mathematics Research Center.
FIXED POINT METHODS FOR THE COMPLEMENTARITY PROBLEM Technical Summary Report
P. K. Subramanian Aug. 1985 24 p
(Contract DAAG29-80-C-0041; Grants NSF DCR-84-20963; NSF MCS-81-02684)
(AD-A160976; MRC-TSR-2857) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is concerned with iterative procedures for the monotone complementarity problem. These iterative methods consist of findng fixed points of appropriate continuous maps. In the case of the linear complementarity problem, it is shown that the problem is solvable if and only if the sequence of iterates is bounded in which case summability methods are used to find a solution of the nonlinear complementarity problem satisfying certain regularity conditions for which the problem has a nonempty bounded solution set. Author (GRA)

N86-20023# Wisconsin Univ., Madison. mathematics Research Center.
ON THE DENSITY OF THE RANGE FOR SOME SUPERQUADRATIC OPERATORS Technical Summary Report
Yiming Long Aug. 1985 23 p
(Contract DAAG29-80-C-0041)
(AD-A160978; MRC-TSR-2859) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the past few years there has been a considerable amount of research on the existence of multiple solution of superlinear differential equations. By superlinear is meant the equations possess a nonlinearity which grows more rapidly than linearly at infinity. This research has been done in the setting of boundary value problems for semilinear elliptic partial differential equations, and preriodicity problems for Hamiltonian systems of ordinary differential equations and semilinear wave equations. GRA

N86-20024# Wisconsin Univ., Madison. Mathematics Research Center.
SUP-NORM ESTIMATES IN GLIMM'S METHOD Technical Summary Report
Blake Temple Aug. 1985 10 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-82-10950)
(AD-A160981; MRC-TSR-2855) Avail: NTIS HC A02/MF A01 CSCL 12/1

A system of two conservation laws in one dimension is a set of first order nonlinear partial differential equations of a certain form (1) where (u,v) is a vector function of (x,t), x epsilon R, t > or = 0. The Cauchy problem asks for a solution of (1) given the initial values of u and v at time t = 0. Equations of type (1) arise, for example, in gas dynamics where they express the conservation of quantities like mass, momentum and energy, when diffusion is neglected. Typically, smooth solutions of (1) cannot be found. This is due to the formation of shock waves. Shock waves are the mechanism by which entropy is dissipated in solutions of (1). This paper gives a proof that solutions exist even after shock waves form, so long as the amplitude of the waves are not too great initially. GRA

N86-20025# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
LIMITING SPECTRAL DISTRIBUTION FOR A CLASS OF RANDOM MATRICES Interim Report
Y. Q. Yin Dec. 1984 27 p
(Contract F49620-85-C-0008)
(AD-A161059; TR-84-50; AFOSR-85-0816TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new combinatorial technique was developed in a previous paper to prove the existence of a limiting spectral distribution. That work can be generalized in two directions. First, we can generalize to the case when X sub P has isotropic columns. This work was done in Yin and Krishnaiah and Bai, Yin, and Krishnaiah. In the second direction, we can prove the result by assuming that X sub p has i.i.d. entries with minimum moment requirements. This paper is devoted to this goal. In this paper, we have succeeded in proving the existence of limiting spectral distribution by assuming only that the second moment exists. The keys to reach this goal are (1) truncation technique and (2) sophisticated combinatorial techniques. The two-stage truncation method works in proving the main result. To prove the main result, we have to generalize the notion of Q-graph to a new kind of graphs M-graphs. Some properties of M-graphs are developed here. In this paper, we have succeeded to prove the existence of the limiting spectral distribution in the sense of a.s. convergence. GRA

N86-20026# California Univ., Santa Barbara. Algebra Inst.
STABILITY ANALYSIS OF FINITE DIFFERENCE SCHEMES FOR HYPERBOLIC SYSTEMS, AND PROBLEMS IN APPLIED AND COMPUTATIONAL LINEAR ALGEBRA Annual Report, 1 May 1984 - 30 Apr. 1985
Marvin Marcus and Moshe Goldberg 22 Aug. 1985 29 p
(Grant AF-AFOSR-0150-83)
(AD-A161092; AFOSR-85-0936TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This interim report describes the following two projects carried out under an Air Force grant during the period May 1, 1984 to April 30, 1985: (1) stability criteria for difference approximations to hyperbolic systems, and multiplicativity of matrix norms, by M. Goldberg; and (2) problems in applied and computational linear algebra, by M. Marcus. The aim of these projects was to achieve better understanding of useful computational techniques for hyperbolic initial-boundary value problems, and to improve basic mathematical tools often used in numerical analysis and applied mathematics. GRA

N86-20027# Wisconsin Univ., Madison. Dept. of Computer Sciences.
ON AN ESTIMATE FOR THE THREE-GRID MGR MULTIGRID METHOD
Seymour V. Parter Aug. 1985 40 p
(Grant AF-AFOSR-0275-82)
(AD-A161096; TR-610; AFOSR-85-0940TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The MGR(upsilon) multigrid algorithm of Ries, Trottenberg and Winter, Algorithm 2.1 of Braess and Algorithm 4.1 of Verfurth are all algorithms for the numerical solution of the discrete Poisson equation based on red-black Gauss-Seidel smoothing iterations. This work considers the extension of the MGR(O) method to a certain general diffusion equation. In particular, for the three grid scheme the author extends an interesting and important result of Ries, Trottenberg and Winter whose results are based on Fourier analysis and hence intrinsically limited to the case where omega is a rectangle. Let omega be a general polygonal domain whose sides have slope + or - 1,0 and infinity. GRA

N86-20028# Wisconsin Univ., Madison. Dept. of Computer Sciences.
ON THE DISTRIBUTION OF THE SINGULAR VALUES OF TOEPLITZ MATRICES
Seymour V. Parter Aug. 1985 21 p
(Grant AF-AFOSR-0275-82)
(AD-A161146; WIS-CS-TR-609; AFOSR-85-0939TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document proves an interlacing theorem for singular values which is applied to obtain extension of the Szego theorem to the singular values of T sub n (f) when f is not a real-valued function. The asympotic distribution of the singular values of Toeplitz matrices can be expressed in the terminology of the theory of equal distribution. GRA

N86-20029# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ON THE APPLICATION OF SCHOENBERG POLYNOMIALS TO THE CALCULATION OF PROFILE COORDINATES [OVER DE TOEPASSING VAN SCHOENBERG POLYNOMEN BIJ DE BEREKENING VAN PROFIEL-COOERDINATEN]
J. J. H. Blom Jan. 1983 32 p refs In DUTCH
(VTH-M-449) Avail: NTIS HC A03/MF A01

Formulas for integrals with equidistant function values as integrands were derived using Schoenberg polynomials; an application, the calculation of profile coordinates of the Timman real functions (sigma and tau) was elucidated. For the Timman conformal transformation method, a more accurate numerical treatment of the Poisson integral was required. Two essential problems, the presence of a cotan with an argument approaching zero and the numerically limited knowledge of sigma and tau, were solved by replacing them by a series development applied to small values and interpolation polynomials. Front point, longest chord, and zero lift angle of a transformation airfoil were determined using Schoenberg interpolation polynomials. Author (ESA)

N86-19978*# Naval Surface Weapons Center, Dahlgren, Va.
AN INTERACTIVE PROGRAM FOR SOFTWARE RELIABILITY MODELING
William H. Farr and Oliver D. Smith *In* NASA. Goddard Space Flight Center Proceedings of the Ninth Annual Software Engineering Workshop Nov. 1984 p 231-263 refs (For primary document see N86-19967 10-61)
Avail: NTIS HC A16/MF A01

N86-20082# Joint Publications Research Service, Arlington, Va.
GENERAL NONASYMPTOTIC ESTIMATES OF THE RATE OF CONVERGENCE OF ITERATIVE STOCHASTIC ALGORITHMS Abstract Only
Ya. I. Alber and S. V. Shilman *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 80 Transl. into ENGLISH from Zhurnal Vychislitelnoy Matematiki I Matematicheskoy Fiziki (Moscow, USSR), v. 25, no. 3, Mar. 1985 p 344-355 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N86-20030# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
STATISTICAL EFFECTS OF IMPERFECT INSPECTION SAMPLING. PART 2: DOUBLE SAMPLING AND LINK SAMPLING, REVISION Technical Report, Jun. - Sep. 1985
N. L. Johnson, S. Kotz, and R. N. Rodriguez Oct. 1985 12 p Prepared in cooperation with North Carolina Univ., Chapel Hill and SAS Inst., Cary, N.C.
(Contract N00014-84-K-0301)
(AD-A160142; UMD-DMSS-85/9-REV) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper, the second in a series of three, utilizes the basic distributions established in the first paper to assess the effect of inspection errors in three types of acceptance procedures: double sampling, link and partial link sampling. GRA

N86-20031# North Carolina Univ., Chapel Hill. Chapel Hill Center for Stochastic Processes.
REMARKS ON THE FOUNDATIONS OF MEASURES OF DEPENDENCE Technical Report, Sep. 1984 - Aug. 1985
R. C. Bradley, W. Bryc, and S. Janson Jun. 1985 55 p
(Contract F49620-82-C-0009)
(AD-A160322; TR-105; AFOSR-85-0877TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper is a study of several aspects of measures of dependence, the various comparisons between them, and their foundation as norms of the bilinear form covariance. Author (GRA)

N86-20032# Naval Postgraduate School, Monterey, Calif.
DISCREPANCY-TOLERANT HIERARCHICAL POISSON EVENT-RATE ANALYSES
D. P. Gaver Jul. 1985 52 p
(AD-A160344; NPS55-85-016) Avail: NTIS HC A04/MF A01 CSCL 12/1

There are units (machines) that generate events (failures) at possibly different, constant, Poisson rates. Having observed a record of such events, it is desired to (a) characterize the overall variability of true rates, and (b) use the result of (a) to create improved estimates of the individual rates by selective pooling. The results are evaluated by simulation, and applied to actual operational data. Author (GRA)

N86-20033# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
DOUBLE SAMPLING IN ESTIMATION OF A RATIO
M. Ahmad, C. Marcotte, and R. S. Singh Jun. 1985 24 p
(Contract F49620-85-C-0008)
(AD-A160346; TR-85-24; AFOSR-85-0750TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Problems connected with the estimation of the ratio of the means of a finite bivariate population have been considered in this report. The usual estimator of the ratio, based on the means of a bivariate simple random sample drawn without replacement (s.r.s. (w.o.r.)), has been compared with estimators based on alternative double sampling design. Under this design a very large s.r.s. (w.o.r.) is drawn for measuring only one of the variables and a subsample (s.r.r. (w.o.r.)) is drawn out of the first phase units for measuring the other variable. Efficiency and bias comparisons have been made by subjecting each of the competitors to the same budgetary constraint. It turns out that deviation from the usual set-up sometimes leads to better sampling strategies. Author (GRA)

N86-20034# North Carolina Univ., Chapel Hill. Chapel Hill Dept. of Statistics.
OPTIMALLY BOUNDED SCORE FUNCTIONS FOR GENERALIZED LINEAR MODELS WITH APPLICATIONS TO LOGISTIC REGRESSION Technical Report, Sep. 1984 - Aug. 1985
L. A. Stefanski, R. J. Carroll, and D. Ruppert Apr. 1985 21 p Prepared in cooperation with Cornell Univ., Ithaca, N.Y.
(Contract F49620-82-C-0009)
(AD-A160348; AFOSR-85-0866TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document studied optimally bounded score functions for estimating regression parameters in a generalized linear model. This work extends results obtained by Krasker & Welsch (1982) for the linear model and provides a simple proof of Krasker and Welsch's first order condition for strong optimality. The application of these results to logistic regression is studied in some detail with an example given comparing the bounded influence estimator with maximum likelihood. Author (GRA)

N86-20035# Wisconsin Univ., Madison. Mathematical Research Center.
SEMI-PARAMETRIC GENERALIZED LINEAR MODELS Technical Summary Report
Peter J. Green and Brian S. Yandell Aug. 1985 20 p
(Contract DAAG29-80-C-0041)
(AD-A160958; MRC-TSR-2847) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document considers generalized linear models in which the linear predictor is of additive semi-parametric form, linear in most of the explanatory variables but with an arbitrary functional dependence on the remainder. Estimation of the parameters and the non-parametric curve in the model is approached by maximizing a penalized likelihood. Two explicit iterative algorithms are presented. The first, which operates in O(n) time per iteration, applies where there is just one variable entering the model in a non-parametric fashion, and an integrated squared second derivative penalty is used. An example in logistic regression of tumour prevalence is given. The second algorithm is for the much more general case of a regression model specified as an arbitrary composite log-likelihood function, permitting nonlinear dependence and several splined variables. Author (GRA)

N86-20036# Wisconsin Univ., Madison. Mathematics Research Center.
DESIGN EFFECTS OF TWO-STAGE SAMPLING Technical Summary Report
C. J. Skinner Jul. 1985 24 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-82-10950)
(AD-A160960; MRC-TSR-2841) Avail: NTIS HC A02/MF A01 CSCL 12/1

In sample surveys, the design effect of a statistic is usually defined as the ratio of its true variance under the given sample design to its variance had the sample been obtained by simple random sampling. Empirical work suggests certain patterns for design effects of different types of statistics under different designs, but theoretical work explaining these patterns is limited. This paper obtains general theoretical results on the structure of design effects for a broad class of statistical inference under a two-stage sampling design. In particular, it discusses the relation between design effects of multivariate and of univariate statistics. This relation is of practical interest because it is of relevance to the imputation of standard errors for multivariate statistics such as correlation coefficients or regression coefficients using design effects of univariate statistics. The latter quantities are often routinely derived on completion of the survey. The former may be difficult to compute by standard procedures, either because of the absence of the necessary design information or because of software or degrees of freedom limitations. GRA

N86-20037# Wisconsin Univ., Madison. Mathematics Research Center.
COMPARISONS OF LEAST SQUARES AND ERRORS-IN-VARIABLES REGRESSION, WITH SPECIAL REFERENCE TO RANDOMIZED ANALYSIS OF COVARIANCE Technical Summary Report
Raymond J. Carroll, P. Gallo, and L. J. Gleser Sep. 1985 22 p
(Contracts DAAG29-80-C-0041; F49620-82-C-0009)
(AD-A160967; MRC-TSR-2866) Avail: NTIS HC A02/MF A01

CSCL 12/1

In an errors-in-variables regression model, the least squares estimate is generally inconsistent for the complete regression parameter but can be consistent for certain linear combinations of this parameter. The authors conjecture that, when least squares is consistent for a linear combination of the regression parameter, it will be preferred to an errors-in-variables estimate, at least asymptotically. The conjecture is false, in general, but it is true for important classes of problems. One such problem is a randomized two-group analysis of covariance, upon which this document focuses. GRA

N86-20038# Pennsylvania State Univ., University Park. Dept. of Statistics.
WHY NOT TRY A ROBUST REGRESSION
Thomas P. Hettmansperger Oct. 1985 24 p
(Contract N00014-80-C-0741)
(AD-A160968; TR-60) Avail: NTIS HC A02/MF A01 CSCL 12/1

There is a multitude of regression diagnostic methods available for identification. This paper discusses three: the leverage values (the diagonal elements of the least squares projection or hat matrix), the Studentized residuals, and the difference in fitted values that results from the elimination of a case (denoted DFFITS). GRA

N86-20039# Wisconsin Univ., Madison. Mathematics Research Center.
ASYMPTOTIC INFERENCE FROM SEQUENTIAL DESIGN IN A NONLINEAR SITUATION Technical Summary Report
C. F. J. Wu Aug. 1985 16 p
(Contract DAAG29-80-C-0041)
(AD-A160970; MRC-TSR-2853) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document shows that confidence regions constructed by the repeated-sampling principle are asymptotically valid for sequential designs in general linear models and nonlinear parameters. For estimation of parameters in nonlinear models or nonlinear parameters in linear models, sequential design of experiment is often used to best utilize the information. It results in saving the number of runs. After the termination of the experiment with a fixed sample size, inference (such as hypothesis testing or confidence interval) about the parameter is made. The classical repeated-sampling principle of inference can not be applied because it relies on the repetition of the same design while in the sequential setting it is not repeatable. By using the martingale as a technical tool, it is shown that, at least for large samples, such inference is still justified. The companion questions of consistency of parameter estimators and convergence of sequential design to an optimal design are also answered. GRA

N86-20040# Wisconsin Univ., Madison. Mathematics Research Center.
ANALYSIS OF FACTORIAL EXPERIMENTS Technical Summary Report
R. D. Meyer Sep. 1985 181 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-84-20968)
(AD-A160972; MRC-TSR-2865) Avail: NTIS HC A09/MF A01 CSCL 12/1

Fractional factorial designs have long been a key tool for the industrial statistician. They have received renewed attention recently due to the movement toward quality improvement sparked by the success of the Japanese in penetrating markets formerly dominated by western countries. Fractional factorial designs are usually not replicated, so that it is not possible to estimate error variance in the usual way from repeat observations. Past methods of analysis have rested on an implicit hypothesis of effect sparsity, that most of the estimated effects measure only noise. Formalization of this hypothesis leads to a Bayesian analysis in which the posterior probability that an effect is active can be computed. A similar approach can be employed to obtain the posterior probability that a particular experimental factor is active. These probabilities are readily interpreted by graphical means, and provide a straightforward method for identifying active contrasts and active factors. In addition, the model is extended to the situation where there are possible outliers in the original observations. The posterior probability that an effect is active can be computed taking into account the possibility of bad values, and the posterior probability that an observation is bad can be computed taking into account that the identity of active effects is unknown. GRA

N86-20041# Wisconsin Univ., Madison.
DISCRETE-TIME CONVERSION FOR SIMULATING SEMI-MARKOV PROCESSES Technical Summary Report
B. L. Fox Aug. 1985 14 p
(Contract DAAG29-80-C-0041; Grant NSF ECS-84-04809)
(AD-A161007; MRC-TSR-2850) Avail: NTIS HC A02/MF A01 CSCL 12/1

To simulate long-run averages of time integrals of a recurrent semi-Markov process efficiently, convert to discrete-time by simulating only an imbedded chain and computing the conditional expectations of everything else needed given the sequence of states visited. This reduces asymptotic variance and eliminates generating holding-time variates. In this setting, uniformizing continuous-time Markov chains is not worthwhile. The authors generalize beyond semi-Markov process and cut ties to regenerative simulation methodology. Author (GRA)

N86-20042# Tennessee Univ., Knoxville. Dept. of Psychology.
RESULTS OF ITEM PARAMETER ESTIMATION USING LOGIST 5 ON SIMULATED DATA
Fumiko Samejima Dec. 1984 236 p
(Contract N00014-81-C-0569)
(AD-A161038; ONR-RR-84-3) Avail: NTIS HC A11/MF A01 CSCL 12/1

In order to evaluate our methods and approaches of estimating the operating characteristics of discrete item responses, it is necessary to try other comparable methods on similar sets of data. LOGIST 5 was taken up for this reason, and was tried upon the hypothetical test items, which follow the normal ogive model and were used frequently in testing our own methods and approaches. Two sets of simulated data we used based upon 500 and 2,000 hypothetical examines, respectively. It was found out that LOGIST 5 provides us with good parameter estimates under certain conditions, in preference to certain other conditions. Author (GRA)

N86-20043# California Univ., Berkeley. Lawrence Berkeley Lab.
QUANTUM MONTE CARLO FOR MOLECULES Annual Summary Report, 1 Jan. - 31 Dec. 1985
William A. Lester, Jr. and Peter J. Reynolds 1 Nov. 1985 32 p
(Contract N00014-83-F-0101)
(AD-A161091) Avail: NTIS HC A03/MF A01 CSCL 20/10

Of particular interest to molecular physics are the quantum mechanical Monte Carlo (or QMC) methods. What we mean by QMC is a Monte Carlo procedure for solving the Schrodinger equation statistically by the simulation of an appropriate random process. The formal similarity of the Schrodinger equation with a diffusion equation allows one to calculate quantum mechanical expectation values as Monte Carlo averages over an ensemble of random walks. The method is procedurally quite simple. As a result, QMC provides an attractive alternative to the conventional variational and perturbation-theoretic techniques used in physics and chemistry. Progress in the report year on the evaluation of: (1) molecular properties, (2) energy derivatives with respect to coordinates, and (3) excited states with the same symmetry as the ground state is described. GRA

N86-20044# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence lab.
PROBABILISTIC SOLUTION OF INVERSE PROBLEMS Ph.D. Thesis
Jose L. Marroquin Sep. 1985 203 p
(Contract N00014-80-C-0505)
(AD-A161130; AI-TR-860) Avail: NTIS HC A10/MF A01 CSCL 12/1

In this thesis we study the general problem of reconstructing

a function, defined on a finite lattice, from a set of incomplete, noisy and/or ambiguous observations. The goal of this work is to demonstrate the generality and practical value of a probabilistic (in particular, Bayesian) approach to this problem, particularly in the context of computer vision. In this approach, the prior knowledge about the solution is expressed in the form of a Gibbsian probability distribution on the space of all possible functions, so that the reconstruction task in formulated as an estimation problem. GRA

N86-20045# Stanford Univ., Calif. Dept. of Statistics.
ON IMPROVING SIMULTANEOUS CONFIDENCE REGIONS FOR TIME SERIES ANALYSIS
Alan J. Izenman and Sanat K. Sarkar 10 Oct. 1985 16 p
(Contract N00014-76-C-0475)
(AD-A161193; TR-365) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper obtains a simultaneous confidence region for the real-valued gains of a dependent stationary Gaussian time series over a collection of independent fixed series, which is substantially shorter than similar confidence regions currently available in the statistical literature. The tools used here for constructing this improved region include a differential identity for the complex multivariate Gaussian distribution and a multivariate probability inequality for the amplitudes of components of a complex-valued Gaussian random vector. Author (GRA)

N86-20046# Stanford Univ., Calif. Dept. of Statistics.
INFERENCE FOR AN EXPERIMENT BASED ON REPEATED MAJORITY VOTES
Jessica Utts 15 Oct. 1985 19 p
(Contract N00014-76-C-0475)
(AD-A161241; TR-366) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider an experiment which consists of n independent Bernoulli sequences, each of which is randomly terminated at either the kth success or the kth failure, whichever comes first. The goals are to make inferences about the per trial probability of success, as well as the probability that a sequence is terminated with a success. The latter is equivalent to the probability that if 2k-1 trials are accumulated, the majority will be successes. Various estimators are investigated, and the results of an ESP experiment fitting this scheme are examined. GRA

N86-20047# Stanford Univ., Calif. Lab. for Computational Statistics.
THE BOOTSTRAP METHOD FOR ASSESSING STATISTICAL ACCURACY
Bradley Efron and Robert Tibshirani Oct. 1985 57 p
(Contract N00014-83-K-0472)
(AD-A161257; LCS-TR-19) Avail: NTIS HC A04/MF A01 CSCL 12/1

This is an invited review of bootstrap methods. It begins with an exposition of the bootstrap estimate of standard error for one-sample situations. Several examples, some involving quite complicated statistical procedures, are given. The bootstrap is then extended to other measures of statistical accuracy, like bias and prediction error, and to complicated data structures such as time series, censored data, and regression models. Several more examples are presented illustrating these ideas. The last third of the paper deals mainly with bootstrap confidence intervals. The paper ends with a FORTRAN program for bootstrap standard errors. GRA

N86-20048# Netherlands Energy Research Foundation, Petten.
DETERMINATION OF CALIBRATION EQUATIONS BY MEANS OF THE GENERALIZED LEAST SQUARES METHOD
Willem L. Zijp Dec. 1984 30 p refs
(ECN-161; B8560104) Avail: NTIS HC A03/MF A01

A mathematical-statistical approach to determine the values of the model parameters and their covariance matrix, which fit best to the mathematical model for the calibration equation, is outlined. The formulas are based on the generalized least squares method, where the term generalized implies that nonlinear equations in the unknown parameters and covariance matrices of the measurement data of the calibration can be taken into account. In the general case an iteration procedure is required. No iteration is required when the model is linear in the parameters, and the covariance matrices for the measurements of coordinates of the calibration points are proportional to each other. Author (ESA)

N86-20049# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
SKIP-LOT SAMPLING PLANS M.S. Thesis - Kent Univ., England
G. B. Derksen Aug. 1984 180 p refs Revised
(IWIS-A-84-ST-53) Avail: NTIS HC A09/MF A01

Two level skip-lot sampling plans used in situations where the order of inspection is the same as that of the production process are discussed. The plans try to keep the fraction of defective items in each lot below a specified value and to minimize the number of inspected lots. This is obtained by skipping the inspection of lots when the quality is supposed to be good. The effect of skipping rules and sampling methods on the operating characteristic curve, the fraction inspected, average run length, and the loss of protection is assessed. Theoretical results are compared with simulation. They do not always agree very well with each other, and the average run length is perhaps not a useful characteristic. Two methods to design Skip-Lot Sampling Plans are compared with Military Standard 105-D. The skip-lot plans have advantages. Author (ESA)

N86-20050# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
THE FOURTEENTH CONFERENCE ON STOCHASTIC PROCESSES AND THEIR APPLICATIONS [DE 14-DE CONFERENTIE STOCHASTISCHE PROCESSEN EN HUN TOEPASSINGEN' IN GOTHENBURG, 12 T/M 16 JUNI 1984]
L. G. Barendregt Jul. 1984 15 p refs In DUTCH Conference held in Goeteborg, Sweden, 12-16 Jun. 1984
(IWIS-B-84-ST-54) Avail: NTIS HC A02/MF A01

A list of lectures on stochastic processes is presented. Topics include Markov processes, random walks, Brownian motion, probability theory, optimization, queueing theory, statistical variance, and population theory. Author (ESA)

N86-20051# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
THE LINEAR FUNCTIONAL RELATIONSHIP MODEL FOR TWO VARIABLES [HET FUNCTIONELE RELATIE MODEL VOOR TWEE VARIABELEN]
Bas Engel Nov. 1984 75 p refs In DUTCH
(Contract IWIS-02.6.17826)
(IWIS-A-84-ST-85) Avail: NTIS HC A04/MF A01

Theoretical backgrounds of parameter estimates, asymptotic characteristics of the estimators, and possible detection of (serious) model deviations in case of two only approximately known linearly related variables are described. The condition of estimating information concerning error variances, error covariances, and normality is shown. Based on this normality, maximum likelihood estimators are presented; least square estimators are derived. Regularity conditions of estimator consistency and asymptotic normal distribution are determined. On the normality condition, asymptotic variances and covariances are derived. A goodness of fit test is described. Approximation methods based on the asymptotic distribution of the residue estimators are described. Author (ESA)

N86-20083# Joint Publications Research Service, Arlington, Va.
BAYESIAN ESTIMATION OF PROBABILITY DISTRIBUTION FUNCTION Abstract Only
V. I. Tikhonov and A. I. Fyedorov *in its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 87 Transl. into ENGLISH from Izvestiya Vysskikh Uchebsnykh Zavedeniy: Radiofizika (Gorky, USSR), v. 28, no. 2, Feb. 1985 p 249-251:

(For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N86-20052# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
A NOTE ON AN INTEGRATED CAUCHY FUNCTIONAL EQUATION
K. S. Lau and H. M. Gu Apr. 1985 14 p
(Contract F49620-85-C-0008)
(AD-A160339; TR-85-10; AFOSR-85-0863TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In characterizing the semistable law, Shimizu reduced the problem into solving an equation where mu and upsilon are given positive measures on infinity. This document obtains a simple proof and shows that some of his conditions can be weakened.
Author (GRA)

N86-20053# Duke Univ., Durham, N. C. Dept. of Computer Science.
A SINGLE SERVER QUEUE IN A HARD-REAL-TIME ENVIRONMENT Interim Report
K. S. Trivedi and F. Baccelli May 1985 17 p
(Grants NSF MCS-83-0200; AF-AFOSR-0132-84)
(AD-A160340; CS-1985-12; AFOSR-85-0747TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This document considers a single server first in first out queue in which arriving task has to be completed within a certain period of time (its deadline). More precisely, each arriving task has its own deadline - a nonnegative real number - and as soon as the response time of one task exceeds its deadline, the whole system is considered to have failed. (In that sense the deadline is hard). The main practical motivation for analyzing such queues comes from the need to evaluate mathematically the reliability of computer systems working with real time constraints (space or aircraft systems for instance). The authors therefore are mainly concerned with the analytical characterization of the transient behavior of such a queue in order to determine the probability of meeting all hard deadlines during a finite period of time (the mission time). The probabilistic methods for analyzing such systems are suggested by earlier work on impatience in telecommunication systems.
GRA

N86-20054# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
DEVELOPING SOURCE SELECTION EVALUATION CRITERIA AND STANDARDS FOR RELIABILITY AND MAINTAINABILITY M.S. Thesis
Daniel E. Harnen, Jr. Sep. 1985 132 p
(AD-A161030; AFIT/GLM/LSQ/85S) Avail: NTIS HC A07/MF A01 CSCL 15/5

This thesis studied the development of source selection evaluation criteria and standards for reliability and maintainability. The data base consisted of information obtained during personal interviews with personnel from Air Force Acquisition Logistics Center. Those interviewed were experienced in the development of source selection criteria and standards for reliability and maintainability. Reliability and Maintainability (R&M) issues have become the prime focus of attention within the Air Force in the development and acquisition of major weapon systems. R&M considerations must be continuously addressed to insure readiness of our Air Force. A weapon system must be able to perform with consistent reliability and be designed for efficient and effective maintainablity.
Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N86-20055# Katholieke Universiteit, Nijmegen (Netherlands).
ASYMPTOTIC ANALYSIS OF NON-LINEAR ELLIPTIC AND PARABOLIC SINGULAR PERTURBATIONS Final Technical Report, Sep. 1982 - Sep. 1985
L. S. Frank Sep. 1985 58 p
(Contract DAJA37-82-C-0731; DA Proj. 1T1-61102-BH-57)
(AD-A159705; R/D-3078-MA) Avail: NTIS HC A04/MF A01 CSCL 12/1

Some classes of Non-linear Second Order Elliptic and Parabolic Partial Differential Operators affected by the presence of a small parameter epsilon are investigated. The reduced problem (epsilon = 0) is characterized by the appearence of a free boundary of the solutions. The Existence, Uniqueness and regularity results are established for both perturbed and reduced problems. Sharp two-sided estimates for the difference of the solutions of the perturbed and reduced problems are proved and some constructive procedures are found out for localizing and computing the free boundary of the reduced problem. The Kinetic Theory of membranes with enzymotic activity is one of the possible fields of applications of the results established, the small parameter being the so-called Michaelis' coefficient.
Author (GRA)

N86-20056# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-H.
THE VACUUM STATES AND THEIR STABILITY IN N=1, D=10 ANOMALY-FREE YANG-MILLS SUPERGRAVITY
J. Kowalski-Glikman Sep. 1985 8 p refs
(NIKHEF-H/85-10; B8573354) Avail: NTIS HC A02/MF A01

The positive energy theorem for N=1, D=10 anomaly-free Yang-Mills supergravity theory is stated and proved. Conditions that the vacuum state of this theory must satisfy are obtained.
Author (ESA)

N86-20057# Joint Publications Research Service, Arlington, Va.
USSR REPORT: PHYSICS AND MATHEMATICS
11 Feb. 1986 105 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UPM-86-005) Avail: NTIS HC A06/MF A01

Research in physics and mathematics is presented in this U.S.S.R. report. Specific topics discussed include: acoustics, crystals, lasers glasses and semiconductors; gas dynamics; fluid dynamics; high temperture physics; lasers; magnetohydrodynamics; molecular physics; nuclear physics; optics and spectroscopy; plasma physics; logic and game theory; numerical analysis and algorthms, probability and statistics; thermodynamics and control theory. For individual titles, see N86-20058 through N86-20084.

N86-20058# Joint Publications Research Service, Arlington, Va.
EXCITATION OF SUPERSHORT DEFORMATION PULSES DURING ABSORPTION OF STRONG OPTICAL RADIATION Abstract Only **c71**
V. E. Gusev *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 1 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 11, no. 11, Nov. 1984 p 2197-2209 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The possibility of implementing a laser picosecond acoustic pulse generator is analyzed theoretically. Processes occurring in

the system when a metal film is applied to the surface of the dielectric are investigated in detail. The generation and propagation of acoustic phonons and deformation waves are investigated using a model of an isotropic solid body disregarding acoustic mismatch at the film-crystal boundary and assuming that the system generates only longitudinal phonons. Formulas are derived for the energy density balance in the film. The model demonstrates effective excitation of deformation waves by the moving front of the heat pulse. It is found that the main contribution to the deformation pulse comes from synchronous excitation of acoustic waves in the region associated with the front of the nonequilibrium flux. Author

N86-20059# Joint Publications Research Service, Arlington, Va.
PHOTOELECTRIC DOMAIN STRUCTURE IN RUBY CRYSTALS Abstract Only **c76**
S. A. Basun, A. A. Kaplyanskiy, and S. P. Feofilov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 3-4 Transl. into ENGLISH from Zhurnal Eksperimentalnoy I Teoreticheskoy Fiziki (Moscow, USSR), v. 87, no. 12, Dec. 1984 p 2047-2061 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

It is shown experimentally that concentrated ruby crystals subjected to laser radiation enter a steady spatially inhomogeneous state with regions (domains) in which the internal electrical field directed along the C axis has the same absolute value but opposite sign. The characteristic restructuring of the domain structure that is accompanied by hysteresis is observed when the crystals are irradiated in an external electrical field. The phonomenon of photo-induced electrical domains in ruby is explained qualitatively by a phenomenological theory that associates the phenomenon with electrical instability of the crystal during irradiation. The instability is caused by the fact that the photovoltaic current arising in a centrally symmetrical ruby in the presence of a field is directed against the field. The photocurrent flowing in the crystal against the applied external electrical field is observed directly by measuring the voltage-current characteristics of optically excited ruby. Reversible phase transition are detected between homogeneous and inhomogeneous (domain) states of optic excited ruby that occur when external conditions change. Characteristic critical behavior of these transitions is established. Author

N86-20060# Joint Publications Research Service, Arlington, Va.
PHOTOELECTRIC DOMAIN STRUCTURE: THEORY Abstract Only **c76**
M. I. Dyakonov and A. S. Furman *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 4 Transl. into ENGLISH from Zhurnal Eksperimentalnoy I Teoreticheskoy Fiziki (Moscow, USSR), v. 87, no. 12, Dec. 1984 p 2063-2074 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

A phenomenological theory of photoelectric instability is constructed that explains the occurrence of a stationary elecurical domain structure in ruby crystals subjected to strong laser radiation. The theory is based on a mechanism proposed in another study to underlie the occurrence of photovoltaic current in an axisymmetrical crystal in the presence of an electrical field directed against the field. The resistance of the specimen in the zero-order field is negative, which results in the development of instability and the spontaneous occurrence of an electrical field in the crystal. Different types of steady field distributions resulting in the application of fields with different strengths are investigated. The occurrence of a reverse photovoltaic current in an electrical field during two-quantum excitation is analyzed. The theory of photoelectric domain instability is in complete accord with the experimental findings: the occurrence of current in ruby crystals directed against the electrical field is firmly established. Author

N86-20061# Joint Publications Research Service, Arlington, Va.
INTERACTION OF CHARGED PARTICLE BEAMS WITH ACTIVE PLASMA MEDIUM Abstract Only **c75**
M. B. Bondarenko, A. N. Kondratenko, and V. I. Tkachenko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 6 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorky, USSR), v. 27, no. 11, Nov. 1984 p 1382-1387 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

This study investigates the interaction of a low-density beam of charged particles with a weakly ionized plasma whose neutral component contains active molecules. The latter are modeled by a nonlinear 2-level system. The effects of the collective interaction between the oscillations excited by the beam and the active medium are taken into account. The amplitude of the oscillations excited in the plasma is assumed to be low, and the beam particles are assumed not to be trapped by the field of these oscillations, i.e., a linear approximation is satisfactory. Periodic pumping of the plasma oscillation energy to active medium energy is observed in a plasma containing active molecules in the absence of a beam. The introduction of a beam of charge particles with comparatively low density into the medium causes additional phase discrepancy between the field of the oscillations and the polarized of the medium. This distorts the regular nature of the energy pumping from the active component to the plasma oscillations and back. For high beam densities the influence of active molecules is significant only in the initial stage of the instability. The parameters of the medium for which the subject interaction can occur are estimated for the example of an ammonia molecule. Author

N86-20062# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF A MODEL OF FLOW OF STREAM OF STRATIFIED FLUID ABOUT A BODY Abstract Only **c34**
K. A. Bezhanov and A. M. Ter-Krikorov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 10 Transl. into ENGLISH from Doklady Akademii Nauk SSR (Moscow, USSR), v. 279, no. 6, Dec. 1984 p 1345-1348 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The plane problemn of the flow of a steady-state stream of stratified fluid about a body is investigated. The number of layers is finite, the bottom is horizontal, and the upper bound is free. The density and tangential component of the velocity vector are discontinuous at the boundaries of the layers, while the pressure and normal component of the velocity vector are continuous. The ox axis runs along the horizontal bottom of the channel, and the oy axis is vertical. The velocity field at the boundary of the bodies is approximate by the velocity field corresponding to flow about the body by a stream of weightless homogeneous fluid. The boundary problem for the multiply-connected region G is transformed to a linear integrodifferential equation that is solved with the help of an auxilary Fredholm equation with symmetrized kernel. The latter equation is shown to have no more than a finite number of positve characteristic numbers. Author

N86-20063# Joint Publications Research Service, Arlington, Va.
THE MECHANISM UNDERLYING DESTRUCTION OF POLYMERS BY RADIATION FROM PULSE-PERIODIC CO2 LASER Abstract Only **c36**
G. G. Gladush, Ye. B. Levchenko, V. G. Nizev, and R. D. Seydgazov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 12 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 11, no. 11, Nov. 1984 p 2294-2300 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

This study investigates the principles underlying the formation of deep ($h/d > 1$) craters in polymethylmethacrylate specimens caused by focused radiation from a pulse periodic CO2 laser. An LGI-50 CO2 laser with pulse length of 100 micron, repetition frequency of 380 Hz and pulse energy of less than 0.05 J was employed. The parameters of the craters formed were analyzed photographically. Analysis of the cratering indicates that, in addition to waveguide processes, gas-phase processes (absorption in vapors and excitation of acoustic oscillations within the crater cavity) are significant. The acoustic currents increase the heat flux on the walls of the crater, causing local expansion; these

processes restrict the possibility of achieving large crater depth-to-diameter ratios. Author

N86-20064# Joint Publications Research Service, Arlington, Va.
FINDING AND DEVELOPING GALLIUM-GARNET ACTIVE LASER MEDIA Abstract Only **c36**
Ye. V. Zharikov, S. P. Kalitin, V. V. Laptev, A. A. Mayer, and V. V. Osiko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 14 Transl. into ENGLISH of Akademiya Nauk SSSR, Inst. Obshchey Fiziki, Fizika Tverdogo Tela, Laboratoriya Fiziki Tverdogo Tela (Moscow, USSR) p 1-28 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

Rare-earth gallium-garnet crystals containing a chromium ion as the activator or sensitizer are developed. An integrated approach is described or developing laser materials that is based on crystallochemical construction, including spectroscopic and technological aspects. The proposed class of laser materials meets all of the basic spectral and lasing requirements, and can be used to develop a number of solid state lasers operating at various wavelengths in the near-IR region of the spectrum. Certain of the physical properties and lasing characteristics of crystal obtained by Chokhralskiy's method are presented. Author

N86-20065# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF STIMULATED MANDELSHTAM-BRILLOUIN SCATTERING OF FOCUSED BEAMS IN THE REPETITIVE-PULSE MODE Abstract Only **c36**
R. R. Buzyalis, A. S. Dementyev, and E. K. Kosenko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 May 1986 p 15 Transl. into ENGLISH from Litovskiy Fizicheskiy Sbornik (Vilnius, USSR), v. 25, no. 1, Jan. - Feb. 1985 p 68-79 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

A YAG:Nd sup (3+) laser operating in a repetitive-pulse mode with pulse repetition frequencies less than 30 Hz was used to study stimulated Mandelsham-Brillouin scattering (SMBS) of the YAG-laser radiation from CC1 sub 4, acetone, and other organic liquids. In CC1 sub 4, which absorbs the YAG radiation weakly, the coefficient of reflection R increased with the laser pulse energy, both for single pulses and in the repetitive-pulse mode, in which the reflection coefficient depended only on the pulse energy. Intense 1-nsec Stokes pulses and an angular divergence of less than 1 mrad were obtained. In acetone it was found that for pulse repetition frequencies less than 5 Hz there is an optimum pumping energy above which R decreases and SMBS is disrupted. As the pulse repetition frequency was increased, R approached zero within several pulses. Observations of transient effect sin SMBS showed that this difference in the behavior of SMBS is linked to the absorption of the pumping radiation in the medium. The subsequent heating of the medium caused strong thermal defocusing of the pumping beam which made it impossible to achieve the intensity threshold required for SMBS scattering. Elucidation of this phenomenon is important because SMBS is used in phase-front reversal as a means for decreasing beam divergence of ruby and neodymium glass lasers operating in the single-pulse mode. Author

N86-20066# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF AMPLIFICATION AND LASING SPECTRUM OF TEA-LASER EMPLOYING MIXTURE OF ISOTOPE-SUBSTITUTED CARBON DIOXIDE MOLECULES Abstract Only **c36**
V. O. Petukhov, N. N. Sazhina, V. S. Starovoytov, S. A. Trushin, N. V. Cheburkin, S. K. Chekin, and V. V. Churakov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 17 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 2, Feb. 1985 p 416-419 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The amplification and lasing spectra in a nonselectve cavity of a TEA-laser employing (C-12)O2 and (C-13)O2 isotope mixtures are investigated experimentally as a function of the degree of excitation of molecular oscillations, the gas pressure, and the content of isotopically substituted molecules. The radiation spectrum of the laser is assumed to be determined uniquely by the amplification spectrum at the maximum of the lasing pulse. A system with nonselective cavity is shown to lase on one or several lines at wavelengths ranging from 11.11 to 11.22 micron for a wide range of active medium pressures (100 - 3500 mm Hg) and excitation levels when a gas mixture is used in which the ratio of (C-13)O2 (x sub 13) and (C-12)O2 (x sub 12) molecules is x sub 13/(x sub 13 + x sub 12) > 0.35 - 0.45. The experimental results confirm the analytical findings regarding the lasing spectrum, indicating that the effectiveness of exciting asymmetrical oscillations of the CO2 and N2 molecules in the electrical discharge is independent of the isotope content. Author

N86-20067# Joint Publications Research Service, Arlington, Va.
DYNAMIC CHARACTERISTICS OF ADAPTIVE OPTICS SYSTEMS **c74**
V. P. Lukin and V. L. Mironov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 28-32 refs Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 9(159), Sep. 1985 p 1959-1961 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The Strehl ratio for an optical system with correction for distortion is examined as a function of time lag. Two adaptive optics systems are compared for effectiveness: a system with continuous lag and a system using the function as well as its derivative for correction. The required bandwidth for an adaptive optics system is determined. Author

N86-20068# Joint Publications Research Service, Arlington, Va.
NONLINEAR ATTENUATION OF PULSED LASER RADIATION ALONG A NEAR-SURFACE ATMOSPHERIC PATH **c36**
N. A. Blinov, I. A. Leontyev, Ye. G. Ryzhkov, V. L. Semenov, V. P. Sinelnikov, S. S. Fillippov, and N. V. Cherburkin *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 33-36 refs Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 10, Oct. 1985 p 2147-2149 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The propagation of intensive pulsed CO2 laser radiation along a near-surface atmospheric path is examined. A mechanism is suggested which explains the anomalous radiation attenuation during a pulse. Author

N86-20069# Joint Publications Research Service, Arlington, Va.
COLLECTIVE EFFECTS DURING INDUCED RADIATION OF ELECTRON BEAM IN WIGGLER WITH AXIAL MAGNETIC FIELD Abstract Only **c75**
A. Kolomenskiy and I. I. Pakhomov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 37 Transl. into ENGLISH from Fizika Plazmy (Moscow, USSR), v. 10, no. 6, Nov. - Dec. 1984 p 1275-1279 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

Hydrodynamic approximation is employed to investigate the dispersion properties of free-electron lasers resulting from the combined operation of collective effects and the magnetic field H corresponding to actual experiments. Two magnetic field configurations are investigated: combination of the spiral field and longitudinal field, and an azimuthally-symmetrical field modulated along the z axis. It is found that, all other conditions being equal, the increment in the instability for the spiral field is somewhat greater than that of the azimuthally-symmetrical field. The increment is found to fall in both cases as the kinetic electron energy and radiation frequency increase. The combination of the wiggler field and a strong focusing longitudinal field changes the nature of the transverse movement of the electrons, and also has a strong influence on their longitudinal movement. Author

N86-20070# Joint Publications Research Service, Arlington, Va.
LASING PROPERTIES OF TWO-COMPONENT DYE SOLUTION

EMPLOYING FLASHLAMP PUMPING IN DIFFERENT SOLVENTS Abstract Only c72

A. M. Saletskiy and V. I. Yuzhakov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 38 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 2, Feb. 1985 p 294-305 (For primary document see N86-20057 10-70)

Avail: NTIS HC A06/MF A01

This study investigates the influence of the solvent on lasing properties in a system of rhodamine 6G and oxazine 17, which exhibits a wide frequency tuning range when flashlamp pumping is employed. It is found that the energy and spectral characteristics of the two-component system are improved by the participation of both components, as well as by donor-to-acceptor transfer of the excitation energy. The increase in 017 lasing efficiency resulting from transfer of the excitation energy from R6G molecules is insignificant, and no change in the solvent to influence the transfer rate of the excitation energy causes any significant change in the lasing efficiency of the two-component system. The lasing characteristics of the multicomponent system is influenced by the solvent chiefly due to modification of the spectral-luminescent properties of the components; the lasing energy of the dye mixture is increased mainly by the gain associated with the direct involvement of donor as well as acceptor molecules. Author

N86-20071# Joint Publications Research Service, Arlington, Va.

BEAM EXTRACTION FROM HIGH ENERGY CYCLOTRONS BASED ON INTEGER RESONANCE Abstract Only c73

L. A. Sarkisyan *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 39 Transl. into ENGLISH from Vestnik Moskovskogo Univ.: Seriya 3 Fizika, Astronomiya (Moscow, USSR), v. 25, no. 6, Nov. - Dec. 1984 p 59-61 (For primary document see N86-20057 10-70)

Avail: NTIS HC A06/MF A01

Beam extraction from strong-current kaon-neutron cyclotrons with proton energy of several GeV is analyzed. In contrast to earlier models, it is found that integer resonance Q sub r = 2 followed by acceleration does not occur but that the bem was extracted on the basis of integer resonance rather than fourth-order nonlinear resonance. It is found that proton extraction on the basis of integer resonance can also be employed in cyclotron pion factories with low energy accumulation per revolution (approximately 400 keV). Author

N86-20072# Joint Publications Research Service, Arlington, Va.

INITIAL EXPERIMENTS ON HIGH FREQUENCY PLASMA HEATING AT TUMAN-3 TOKAMAK Abstract Only

L. G. Askinazi, V. Ye. Golant, S. G. Goncharov, M. P. Gryaznevich, V. K. Lusev, V. V. Dyachenko, A. B. Izvozchikov, A. I. Kislyakov, S. V. Krikunov, and S. V. Lebedev *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 40 Transl. into ENGLISH from Pisma V Zhurnal Tekhnicheskoy Fiziki (Leningrad, USSR), v. 11, no. 5, 12 Mar. 1985 p 315-318 (For primary document see N86-20057 10-70)

Avail: NTIS HC A06/MF A01

The conditions for injecting hf power at the ion cyclotron resonance frequency are investigated and optimized experimentally with the help of a high-power generator loaded to a metal antenna. The power input to the plasma was 50 to 150 kW. The absorption efficiency was investigated as a function of the longitudinal magnetic field size and the amount of hydrogen added to the deuterium plasma. The replacement of deuterium by hydrogen is found not to change the parameters of the ohmic heating mode significantly. Experiments on ion cyclotron heating are described in which a single antenna contained a 72 x 330 sq mm tube is employed. The hf power is found to be contained in the stationary stage of the discharge, 25 to 35 msec after initiation. Oscillograms are presented of the discharge parameters in which the main working gas is deuterium. The increase in deuteron and proton temperature measured spectrally is analyzed as a function of the concentration of added hydrogen. Significant electron heating in modes was noted with a strong longitudinal field. Author

N86-20073# Joint Publications Research Service, Arlington, Va.

ESTIMATION OF MINIMUM LIGHT FLUX DETERMINED BY PHOTON NOISE FOR ADAPTIVE IMAGE VIBRATION COMPENSATION SYSTEM Abstract Only c74

A. N. Bogaturov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 43 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorky, USSR), v. 27, no. 11, Nov. 1984 p 1410-1418 Original language document was announced in IAA as A85-20630 (For primary document see N86-20057 10-70)

Avail: NTIS HC A06/MF A01

An adaptive-optic system whose measuring element is a Hartmann sensor cell is examined in the case of the precise measurement of the center of gravity of the coordinates of registered photocounts. An expression is obtained for the optimal gain factor n the corrector chain. It is shown that a nonoptimal choice of this factor can lead to an increase in the jitter in the case of a small number of registered photons. An expression for the minimal light flux and numerical estimates for the case of astronomical observations are also presented. L.M. (IAA)

N86-20074# Joint Publications Research Service, Arlington, Va.

INVESTIGATION OF RELATIVE CURRENT DENSITY DISTRIBUTION IN POWERFUL PULSE ELECTRON BEAM BY PHOTOMETER REGISTRATION OF X-RAY BREMSSTRAHLUNG Abstract Only c74

A. A. Golubev, A. Kh. Kadymov, and O. I. Radkevich *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 45 Transl. into ENGLISH from Radioelekronika Uskoriteley I Fizicheskogo Eksperimenta (Moscow, USSR), 1982 p 11-21 (For primary document see N86-20057 10-70)

Avail: NTIS HC A06/MF A01

A pulse electron beam with E = 400 keV, I = 25 A and rectangular pulse shape is investigated photographically with allowance for the influence of the finite dimensions of the aperture of the camera. The electron beam was received in a vacuum by a flat tantalum target set at 45 deg to the axis of the beam 2 meters from the accelerator. The resulting X-ray bremsstrahlung (gamma radiation) exits the camera chamber and is recorded on film. The picture of the density distribution of the gamma radiation sources at the target corresponds to the distribution density of the current across the cross section of the electron beam. The optical density curves were recorded photometrically as a function of the radius on an automatic MF-431 microphotometer. This method is found to provide acceptable accuracy even under the unfavorable sensitivity conditions of the experiment. The use of high sensitivity film in conjunction with amplifying luminescent screen film makes it possible to enhance the accuracy of the method by placing the films farther from the aperture. This reduces the error in the mathematical allowance for the influence of the aperture, improves the photometry accuracy and makes it possible to operate in the linear section of the film characteristic. Author

N86-20075# Joint Publications Research Service, Arlington, Va.

CHARACTERISTICS OF A GARNET MAGNETIC MIRROR WITH WAVELENGTH OF 1.15 MICRON Abstract Only c74

I. A. Andronova, Yu. A. Gusev, Yu. N. Konoplev, M. A. Mamayev, M. A. Novikov, and A. A. Turkin *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 47 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy Mv I SSO SSSR: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 388-392 Original language document was announced in IAA as A85-34890 (For primary document see N86-20057 10-70)

Avail: NTIS HC A06/MF A01

Loss characteristics and phase and amplitude nonreciprocity of a garnet magnetic mirror (GMM) at a wavelength of 1.15 microns are computed, and some experimental results which describe the phase nonreciprocity of the GMM in terms of the incidence angle are discussed. It is pointed out that the use of a submicron garnet film of appropriate thickness will make it possible to reduce the losses to 0.1 to 0.2 percent without changing the phase nonreciprocity value. The study is pertinent to the design of laser gyros, in which GMMs are presently being used. L.T. (IAA)

N86-20076# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF HOLOGRAM RECORDING IN IMPURITY CRYSTALS OF LITHIUM NIOBATE AT 325 nm Abstract Only **c74**
V. Yu. Kozlova and R. K. Ovsepyan *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 58 Transl. into ENGLISH from Doklady Akademii Nauk Armyanskoy SSR (Yerevan, USSR), v. 79, no. 5, Sep. - Oct. 1:9984 p 214-217 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

Photo refraction is investigated in LiNbO3 crystals at 325 nm in order to determine the mechanism that underlies recording at that wavelength, and to determine recording sensitivity. The experiments employed pure and iron-doped Y-cut LiNbO3 crystals 300 micrometers thick. The induced change in birefringence was measured holographically and polarization-optically. The diffraction efficiency of the holograms is analyzed as a function of exposure during reading and writing. Reading causes the hologram to be erased, with a time constant far shorter than in the visible band. No macroscopic phase distortions of the recorded segment that would degrade hologram quality were observed during reading and writing, which allows repeated read-write cycles without significant degradation in hologram sensitivity or quality. The maximum diffraction efficiency and photo refractive sensitivity are tabulated. Photo refraction at 325 nm is found to occur primarily due to a diffuse mechanism of separation of nonequilibrium carriers. Lithium niobate crystals can be used to record dynamic holograms, and for real time interferometry. Author

N86-20077# Joint Publications Research Service, Arlington, Va.
NUMERICAL MODELING OF TWO-DIMENSIONAL LANGMUIR TURBULENCE Abstract Only **c75**
L. M. Degtyarev, I. M. Ibragimov, R. Z. Sagdeyev, G. I. Solovev, V. D. Shapiro, and V. I. Shevchenko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 60 Transl. into ENGLISH from Pisma V Zhurnal Eksperimentalnoy I Teoreticheskoy Fiziki (Moscow, USSR), v. 40, no. 11, 10 Dec. 1984 p 455-459 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

This study presents the results of numerical modeling of two-dimensional (x,y) turbulence created by a pumping wave with electrical field oriented along the X axis and unidimensional amplitude. The pumping models either the electromagnetic wave in the vicinity of plasma resonance, or long-wave plasma oscillations excited by the beam in the plasma. The turbulence is modeled on the basis of Zakharov's equations, modified to allow for the presence of the pumping wave and for absorption of oscillations by resonant particles in the short wave part of the spectrum for both modes forming the turbulence - the high frequency plasma and slow modes of quasineutral density perturbations. It is found that the Langmuir oscillation energy is localized in continuously generated collapsing caverns that burn up due to Landau attention. The integral characteristics of the quasisteady state obtained numerically agree satisfactorily with the analytical model. Author

N86-20078# Joint Publications Research Service, Arlington, Va.
HIGH FREQUENCY PLASMA HEATING AT FINITE PRESURE IN REGION OF ION CYCLOTRON FREQUENCIES Abstract Only **c75**
D. L. Grekov and K. N. Stepanov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 61 Transl. into ENGLISH from Fizika Plazmy (Moscow, USSR), v. 10, no. 6, Nov. - Dec. 1984 p 1211-1218 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The heating of an inhomogeneous plasma cylinder by electromagnetic waves at approximately the ion cyclotron frequency is investigated. Analytical expressions are derived for the amount of power absorbed by the plasma. It is found that ion cyclotron resonance of the primary gas is an effective heating mechanism in Drakon-type installations with reactor parameters, in contrast to systems with small beta. The cyclotron attenuation at harmonics of the ion cyclotron frequency of the primary gas is found to be very strong. The width of the cyclotron resonance zone for waves with small enough values of k parallel is smaller than the plasma dimensions because of the plasma diamagnetism. Cherenkov absorption by electrons is also strong. It is found possible to excite intrinsic oscillations only for small values of k parallel or in small installations; cyclotron resonance by the Alfven branch of the oscillations can be employed in small installations. Author

N86-20079# Joint Publications Research Service, Arlington, Va.
EMISSION OF ELECTROMAGNETIC WAVES BY A MODULATED ELECTRON BEAM IN A RECTANGULAR WAVE GUIDE FILLED WITH A LONGITUDINALLY INHOMOGENEOUS PLASMA Abstract Only **c75**
S. M. Levitskiy and I. A. Anisimov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 64 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy MV I SSO SSSR: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 298-302 Original language document was announced in IAA as A85-34880 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The Lorentz lemma is used to study the problem of stimulated electromagnetic emission during the excitation of a plasma resonance region in an inhomogeneous plasma in a rectangular waveguide by a modulated electron beam with a random current density distirbution across the waveguide. It is shown that for small dimensions of spatial plasma inhomogeneities (L) the amplitude of the radiation field increases with increasing L due to the larger number of electrons involved in the emission process. At larger L the plasma resonance region is excited non-phase-synchronously by the modulated electron beam, thereby weakening the emission. L.T. (IAA)

N86-20080# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF THERMAL FIELD OCCURRING DURING LASER HEATING OF METALS Abstract Only **c77**
N. A. Kirichenko and Yu. Yu. Morozov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 76 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 11, no. 11, Nov. 1984 p 2331-2335 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

This study analyzes the stability of the thermal field occurring during laser heating of a massive metal specimen in an oxidizing medium (air), and investigates behavior of the stability boundary for different external conditions. A system of three equations is derived that defines the surface which divides the entire parameter space into regions with different numbers of steady-state solutions of the slot boundary problem. The stability boundary is calculated for several values of the heat loss parameter, and the behavior of the temperature along the stability boundary is examined. The boundary problem is characterized by the intensity of radius of the radiation beam, in addition to the heat loss factor. Author

N86-20081# Joint Publications Research Service, Arlington, Va.
KINETIC COOLING IN BINARY MIXTURES OF MOLECULAR GASES DURING TWO-QUANTUM EXCHANGE OF OSCILLATING ENERGY Abstract Only **c72**
U. S. Dzhurabekov and A. I. Osipov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 77 Transl. into ENGLISH from Vestnik Moskovskogo Univ.: Seriya 3 Fizika, Astronomiya (Moscow, USSR), v. 25, no. 6, Nov. - Dec. 1984 p 44-47 Original language document was announced in IAA as A85-24059 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The effect of kinetic cooling in binary mixtures of molecular gases under two-quantum vibrational energy transfer between the components is investigated analytically. It is shown that in the mixtures CH3F-N2 and CH4-02, the kinetic cooling effect due to two-quantum vibrational transfer can be observed experimentally. This makes it possible to determine the probability of the two-quantum transfer of vibrational energy. V.L. (IAA)

N86-20082# Joint Publications Research Service, Arlington, Va.
GENERAL NONASYMPTOTIC ESTIMATES OF THE RATE OF CONVERGENCE OF ITERATIVE STOCHASTIC ALGORITHMS Abstract Only **c64**
Ya. I. Alber and S. V. Shilman *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 80 Transl. into ENGLISH from Zhurnal Vychislitelnoy Matematiki I Matematicheskoy Fiziki (Moscow, USSR), v. 25, no. 3, Mar. 1985 p 344-355 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

The convergence of iterative stochastic algorithms of the following form as studied: x sub n + 1 = Pi sub G [x sub n = alpha sub n s sub n (x sub n)], n = 1, 2, 3, ... , where x sub n is a vector in R sup m, s sub n (x sub n) is a vector of random observations at the n-th iteration at the point x sub n, alpha sub n > or = 0 is the stp parameter, and Pi sub G is a projection operator onto a closed convex set G element of R sup M. Such algorithms are widely used to solve diverse probabilistic problems, in particular, the minimization of functions in the presence of random errors. Previous work on obtaining analytic estimates of the indicators indicating the accuracy of the iterative process for alpha sub n of the form alpha sub n sup-1 and n > 0 was extended to arbitrary forms of alpha sub n. The rate of convergence of the quantity lambda sub n = M [V (x sub n)] to zero, where M is the mathematical expectation operator and V is the Lyapunov function of the form rho sup 2 (x, X*), i.e. the square of the distance of the point x from the set X* of all solutions, was studied and theorems on the upper limit of lambda sub n were proved.
Author

N86-20083# Joint Publications Research Service, Arlington, Va.
BAYESIAN ESTIMATION OF PROBABILITY DISTRIBUTION FUNCTION Abstract Only **c65**
V. I. Tikhonov and A. I. Fyedorov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 87 Transl. into ENGLISH from Izvestiya Vysskikh Uchebsnykh Zavedeniy: Radiofizika (Gorky, USSR), v. 28, no. 2, Feb. 1985 p 249-251: (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

This study describes the Bayesian approach to estimating the unknown probability distribution function of a random quantity using an independent sample of finite size. In contrast to the traditional method, the Bayesian approach makes allowance for a priori information about the nature of the random quantity in question, and makes it possible to determine the sample size needed to obtain an estimate with the required variance. The Bayesian approach is found to be inadvisable for small samples because of the large variance.
Author

N86-20084# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE TRAJECTORY SENSITIVITY OF ADAPTIVE STOCHASTIC CONTROL SYSTEMS Abstract Only **c63**
A. I. Petrov, A. G. Zubov, and V. V. Minin *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 89 Transl. into ENGLISH from Avtomatika (Kiev, USSR), no. 2, Mar. - Apr. 1985 p 51-59 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

Methods for studying the sensitivity of the trajectories of adaptive stochastic control systems, described by symmetric linear stochastic differential matrix equations with additive Gaussian noise and coefficients which are analytic functions of the time and of the Gaussian noise vector, to parametric and coordinate perturbations were constructed and applied to the study of adaptive systems with a stochastic standard model and with identifiers and to model-following systems and traditional linear systems with feedback. It was shown that in both insensitivity-optimal adaptive systems and model-following systems the use of a stochastic standard model makes it possible to decrease the effect of uncontrollable perturbations, which result is linked to the inherently closed nature of the adaptation processes in these systems.
Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N86-20085 Washington Univ., Seattle.
SOUND RADIATION FROM ISOTROPIC PALTES STIFFENED BY RECTANGULAR GRID NETWORKS Ph.D. Thesis
Abdel-Salaam Mohamad 1985 105 p
Avail: Univ. Microfilms Order No. DA8521632

A comprehensive and mathematical model for predicting the vibrational displacement of and the sound generated by a vibrating plate that is stiffened by periodically spaced, orthogonal beams subjected to a sinusoidally time varying point load is developed. The plate is assumed to be infinite in extent, and the beams are considered to exert both line force and moment reactions on it. Structural damping is included in both late and beam materials. A space harmonic series representation of the spacial variables is used in conjunction with the Fourier transform to find the displacement and the sound pressure in terms of harmonic coefficients which depend on the details of the structure. Results are shown for the sound pressure level measured on axis in a semi-infinite fluid (water) bounded by the plate for various locations of application of an external time harmonic point force on the plate. The determination of sound pressure radiated from period plate structures like the one described is fundamental in the estimation of noise levels in aircraft fuselages or similar periodic structures.
Dissert. Abstr.

N86-20086*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACOUSTIC GUIDE FOR NOISE TRANSMISSION TESTING OF AIRCRAFT Patent Application
Rimas Vaicaitis, inventor (to NASA) (Columbia Univ., N.Y., N.Y.) Filed 3 Jul. 1985 13 p Sponsored by NASA
(NASA-Case-LAR-13111-1-CU; NAS 1.71:LAR-13111-1-CU; US-Patent-Appl-SN-751695) Avail: NTIS HC A02/MF A01 CSCL 20A

Selective testing of aircraft or other vehicular components without requiring disassembly of the vehicle or components was accomplished by using a portable guide apparatus. The device consists of a broadband noise source, a guide to direct the acoustic energy, soft sealing insulation to seal the guide to the noise source and to the vehicle component, and noise measurement microphones, both outside the vehicle at the acoustic guide output and inside the vehicle to receive attenuated sound. By directing acoustic energy only to selected components of a vehicle via the acoustic guide, it is possible to test a specific component, such as a door or window, without picking up extraneous noise which which may be transmitted to the vehicle interior through other components or structure. This effect is achieved because no acoustic energy strikes the vehicle exterior except at the selected component. Also, since the test component remains attached to the vehicle, component dynamics with vehicle frame are not altered.
NASA

N86-20087*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SINGLE MODE LEVITATION AND TRANSLATION Patent Application
Martin B. Barmatz (JPL, Pasadena, Calif.) and James L. Allen, inventors (to NASA) Filed 18 Oct. 1985 17 p
(Contract NAS7-918)
(NASA-Case-NPO-16675-1-CU; NAS 1.71:NPO-16675-1-CU; US-Patent-Appl-SN-789266) Avail: NTIS HC A02/MF A01 CSCL 20A

A single frequency resonant mode is applied by a transducer to acoustically levitate an object within a chamber. This process allows smooth movement of the object and suppression of unwanted levitation modes that would urge the object to a different levitation position. A plunger forms one end of the chamber, and the frequency changes as the plunger moves. Acoustic energy is applied to opposite sides of the chamber, with the acoustic energy

on opposite sides being substantially 180 degrees out of phase. NASA

N86-20088*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATUS AND CAPABILITIES OF SONIC BOOM SIMULATORS
Kevin P. Shepherd and Clemans A. Powell Jan. 1986 8 p refs
(NASA-TM-87664; NAS 1.15:87664) Avail: NTIS HC A02/MF A01 CSCL 20A

The current status and capabilities of sonic boom simulators which might be used in future studies of the effects of sonic boom on people, animals, or structures is summarized. The list of candidate simulators is based on a literature search which was confined to the United States and Canada. Some of the simulators are fully operational, others could be made operational with a modest investment, and still others would require a major investment. For the sake of the completeness, some simulators which were the subject of a previous review, but which no longer exist, are also included herein. Author

N86-20089*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
IN-FLIGHT ACOUSTIC MEASUREMENTS ON A LIGHT TWIN-ENGINED TURBOPROP AIRPLANE Final Report
J. F. Wilby, C. D. McDaniel, and E. G. Wilby Nov. 1985 233 p refs
(Contract NAS1-16521)
(NASA-CR-178004; NAS 1.26:178004) Avail: NTIS HC A11/MF A01 CSCL 20A

Four series of flight tests were conducted to measure sound pressure levels inside and outside the cabin of a twin-engined turboprop airplane. Particular emphasis was placed on harmonics of the propeller blade passage frequency. The cabin was unfurnished for the first three flights, when the main objective was to investigate the repeatability of the data. For the fourth flight, the cabin was treated with fiberglass batts. Typically, the exterior sound pressure levels were found to vary 3 to 5 dB for a given harmonic, but variations as high as 8 dB were observed. The variability of harmonic levels within the cabin was slightly higher but depended on control of the relative phase between the propellers; when phase was not controlled the average variability was about 10 dB. Noise reductions provided by the fuselage structure were in the range of 20 to 40 dB, when an exterior microphone in the plane of rotation of the propeller was used as reference. Author

N86-20090# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
INTERNATIONAL CIVIL AVIATION ORGANIZATION HELICOPTER NOISE MEASUREMENT REPEATABILITY PROGRAM: US TEST REPORT, BELL 206L-1, NOISE MEASUREMENT FLIGHT TEST
J. S. Newman, E. J. Rickley, and M. Locke Sep. 1985 427 p
(AD-A159898; FAA/EE-85-6) Avail: NTIS HC A19/MF A01 CSCL 14/2

This document reports the findings of the U.S test team's participation in the Helicopter Noise Measurement Repeatibility Program (HNMRP). The U.S./Canadian flight test was held in August of 1984 at Dulles International Airport near Washington, D.C. The principal objective of this international HNMRP is to refine noise certification testing requirements. Participating nations conducted the test programs on the same type helicopter, the Bell 206L-1 (or the acoustically equivalent 206L-3), using the same test procedures. Analyses in this document include the investigation of source noise adjustments based on increases in noise level with advancing blade tip Mach number, the examination of relative source contributions in the helicopter acoustical spectrum, and source directivity for both in-flight and static operations. This report contains helicopter noise definition information (useful in environmental impact analyses) for level flyovers at various airspeeds and altitudes, and ICAO takeoff and approach procedures. Data are also shown for a noise abatement operation involving dynamic changes in torque, rate of descent and airspeed. This report also provides information for the hover-in-ground effect, flight idle and ground idle static operations. GRA

N86-20091# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
ANNUAL SUMMARY REPORT FOR ONR CONTRACT NUMBER N00014-81-K-0011, INVESTIGATION FROM NOVEMBER 1984 TO THE PRESENT
K. Ono Sep. 1985 8 p
(Contract N00014-81-K-0011; DA Proj. RR0-1108)
(AD-A159899) Avail: NTIS HC A02/MF A01 CSCL 20/11

This investigation is aimed at studying emission for applications to residual stress measurements and for the evaluation of structural integrity of engineering structures. Effects of microstructure, composition and prior cold working on magnetomechanical acoustic emission (MAE) have been studied. Magnetization behavior, magnetostriction and Barkhausen noise are affected by stress as well as other parameters. These responses will be measured simultaneously in order to identify the the stress level uniquely. Combinations of advanced signal analysis methods at present, and have been studied to identify the optimum parameters for applications. In the second part of this study, acoustic emmission from materials undergoing plastic deformation and fracture has been examined in and attempt to improve detection capability of the impending structural failure. Our previously established techniques are extended in studying the acoustic emission behavior of advanced aluminum alloys and composite materials. Digital signal analysis techniques are used to investigate further the different types of acoustic emission behavior of advanced aluminum alloys and composite materials. Digital signal analysis techniques are used to investigate further the different types of acoustic emission signals from various sources. A major emphasis has been placed on the fracture related AE in high strength aluminum-lithium alloys and fiber-reinforced advanced composites including metal matrix (Al-SiC) and resin matrix (graphite-epoxy) materials. GRA

N86-20092# Open Univ., Milton (England). Faculty of Technology.
COORDINATION OF RESEARCH ON MECHANICAL WAVES IN PARTICULATE MATERIALS Interim Report, Mar. - Sep. 1985
K. Attenborough Sep. 1985 9 p
(Contract DAJA45-84-C-0037)
(AD-A159993; R/D-4541-EN-01; IR-3) Avail: NTIS HC A02/MF A01 CSCL 20/1

The Biot theory is reconciled with classical rigid-porous theory for air filled soils. The biot frequency dependent viscosity function was introduced to account for viscous drag between entrained pore fluid and the solid matrix of a fluid saturated porous solid during passage of a sound wave. A layered poroelastic system was analyzed by maxima in seismic transfer spectra and by sperical wave incidence. A more refined computation of the acoustic-to-seismic transfer spectrum and analysis of acoustically induced seismic waves is studied. E.R.

N86-20093# Texas Univ., Austin. Austin Applied Research Lab.
NONLINEAR ACOUSTICS: LONG RANGE UNDERWATER PROPAGATION, AIR-FILLED POROUS MATERIALS, AND NON-COLLINEAR INTERACTION IN A WAVEGUIDE Annual Summary Report, 1 Aug. 1984 - 31 Oct. 1985
David T. Blackstock 28 Oct. 1985 17 p
(Contract N00014-84-K-0574; DA Proj. RR0-1108)
(AD-A161037; ARL-TR-85-36; ASR-1) Avail: NTIS HC A02/MF A01 CSCL 20/1

Research on three topics in nonlinear acoustics is described. (1) Nonlinear effects in long range underwater propagation. The equations of nonlinear geometrical acoustics have been derived from the general equations of fluid mechanics for an inhomogeneous fluid. And analytical solution for the waveform of an arbitrary pressure signal traveling along a ray path has been implemented by a computer program. Not included in the program are effects of reflection and focusing. (2) Nonlinear effects in air-filled bulk porous materials. Theory and experiments on the propagation of intense airborne sound in bulk porous materials

are described. The primary source of nonlinearity is the velocity dependent resistivity of the materials. (3) Nonlinear interaction in rectangular waveguide. Two problems are considered, (a) distortion of a wave launched as a single tone in the 1,0 mode of the waveguide, and (b) noncollinear interaction of two noncollinear tones, one a low frequency wave in the 0,0 mode, the other a high frequency wave in the 1,0 mode. GRA

N86-20094# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
B-52G CREW NOISE EXPOSURE STUDY
William H. Decker and Charles W. Nixon 30 Aug. 1985 49 p (AF Proj. 7231)
(AD-A161112; AFAMRL-TR-85-056) Avail: NTIS HC A03/MF A01 CSCL 20/1

The B-52G aircraft produces acoustic environments that are potentially hazardous, interfere with voice communications and may degrade task performance. Numerous reports from aircrew of high noise levels at crew location have been documented for those B-52G aircraft that have been modified with the Offensive Avionics System. To alleviate and minimize the excessive noise exposures of aircrews, a study of the noise problem in the b-52G was deemed necessary. First, in-flight noise measurements were obtained at key personnel locations on a B-52G during a typical training mission. Then, extensive laboratory analyses were conducted on these in-flight noise data. The resulting noise exposure data were evaluated in terms of the various segments of and the total flight profile relative to allowable noise exposures. Finally, recommendations were developed for short term and long term approaches toward potential improvement in the B-52G noise exposure problem. Author (GRA)

N86-20095# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTAL STUDY OF THE ACOUSTIC FIELDS FAR AND NEAR A MICROTURBO TRS 18 TURBOREACTOR [ETUDE EXPERIMENTALE DES CHAMPS ACOUSTIQUES PROCHES ET LOINTAINS D'UN TURBOREACTEUR MICROTURBO TRS 18]
Ch. Johe and J. Haertig 26 Jun. 1984 42 p refs In FRENCH
(ISL-R-113/84) Avail: NTIS HC A03/MF A01

An experimental study was carried out to compare the acoustic field of a small turbojet with the field generated by a cold free jet excited or not. With subsonic jets the wide band noise shows a sinus variation associated to the turbine excitation. The azimuth field distribution is similar to that of the free jet. At maximum velocity the supercritical jet shows a far field similar to that of a nonexcited jet. The maximum emission is at a 30 deg angle, corresponding to the Oertel W Mach waves. Author (ESA)

N86-20096# Institut Franco-Allemand de Recherches, St. Louis (France).
COCHLEAR MECHANISMS INVOLVED IN THE AUDITORY THRESHOLD AND IN AUDITORY FATIGUE Final Report [MECANISMES COCHLEAIRES IMPLIQUES DANS LE SEUIL DE SENSIBILITE AUDITIVE ET LA FATIGUE AUDITIVE]
P. Campo (INRS, Nancy, France), A. Dancer, and R. Franke 25 Sep. 1984 100 p refs In FRENCH; ENGLISH summary
(Contract ETBS/CETAM-82.02.050)
(ISL-R-119/84) Avail: NTIS HC A05/MF A01

The study of the auditory fatigue induced in guinea pigs exposure to pure tones applied at a constant level at the input to the cochlea showed that the velocity of displacement of the cochlear partition plays a decisive role in the origin of the auditory fatigue. This parameter is also responsible for the starting of the auditory responses at threshold. For a constant level at the input to the cochelea, the fatiguing power of pure tones increases with the frequency (from 2 to 11,3 KHz). The validity of the A weighted curve for the evaluation of the fatiguing power of complex acoustic signals is examined. Author (ESA)

N86-20097# Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY OF THE NOISE RADIATED BY THE WAKE OF A CYLINDER PLACED IN A JET FLOW [ETUDE DU BRUIT RAYONNE PAR LE SILLAGE D'UN BARREAU PLACE DANS UN ECOULEMENT]
M. Schaffar, J. Juret, and J. J. Brunner 6 Sep. 1984 34 p refs In FRENCH
(ISL-R-120/84) Avail: NTIS HC A03/MF A01

A cylindrical body of 5 mm diameter was placed in a 120 m/sec jet flow produced by a 25 mm diameter nozzle. The study was performed using a dalambertometer along the path of a laser beam. The correlations between the volume operator and the acoustic pressure are measured in far fields at 30 and 90 deg. The existence of acoustic sources in the wake is shown. The contribution of these sources is important at frequencies near the cylinder critical frequency. The sources are bipolar and the length of the bipole is two diameters. Author (ESA)

N86-20058# Joint Publications Research Service, Arlington, Va.
EXCITATION OF SUPERSHORT DEFORMATION PULSES DURING ABSORPTION OF STRONG OPTICAL RADIATION Abstract Only
V. E. Gusev *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 1 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 11, no. 11, Nov. 1984 p 2197-2209 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N86-20098*# Michigan Univ., Ann Arbor. Space Physics Research Lab.
DEFINITION PHASE FOR THERMAL ION DYNAMICS EXPERIMENT FOR OPEN Final Report
William E. Sharp [1985] 6 p
(Contract NAS8-34910)
(NASA-CR-178677; NAS 1.26:178677) Avail: NTIS HC A02/MF A01 CSCL 20H

The Thermal Ion Dynamics Experiment (TIDE) combines differential measurements of angle, energy, and mass to determine the detailed distribution function of low energy magnetospheric ions in the range of 0 to 100 eV. Goals included designing a 1 sq cm entrance aperture, minimizing trajectory divergence at exist aperture, and minimizing internal scattering. Design parameters were used to construct the test model. B.G.

N86-20099# Chicago Univ., Ill.
INVESTIGATION OF THE SPATIALLY ISOTROPIC COMPONENT OF THE LATERALLY AVERAGED MOLECULAR HYDROGEN/Ag(3) PHYSISORPTION POTENTIAL Interim Technical Report
C. F. Yu, K. B. Whaley, C. S. Hogg, and S. J. Sibener Aug. 1985 72 p
(Contract N00014-77-C-0240)
(AD-A159682; AD-E801193; TR-6) Avail: NTIS HC A04/MF A01 CSCL 20/10

A comprehensive study of the spatially isotropic component of the laterally averaged molecular hydrogen/Ag(111) physisorption potential is presented. Diffractive selective adsorption scattering resonances for rotationally state-selected H2 and D2 on Ag(111) have been mapped out as a function of incident polar angle for several crystal azimuths and beam energies. These resonances have been used to determine the bound eigenvalues, and subsequently the shape, of the potential well. Best fit Lennard-Jones, Morse, variable exponent, and exponential-3 potentials having well depths of approximately 32 MeV are derived from the data. These measurements are supported by rotationally inelastic scattering measurements for HD and exact close-coupled quantum scattering calculations. Debye-Waller attenuation measurements are also presented for H2, D2, and HD. The ability to detect these diffractively coupled resonances on a closest-packed metallic surface, i.e., a surface of extremely low corruga-

tion, suggests that such measurements can be carried out on a much wider class of surfaces than previously envisioned. GRA

N86-20100# Oak Ridge National Lab., Tenn.
BASIC STUDIES OF GASES FOR FAST SWITCHES Annual Summary Report, 1 Oct. 1984 - 30 Sep. 1985
L. G. Christophorou and S. R. Hunter Nov. 1985 66 p
(Contract N00014-82-F-0123)
(AD-A161012; AD-F620003) Avail: NTIS HC A04/MF A01 CSCL 09/1

Desirable electron attachment and electron drift characteristics of gases for possible use in diffuse-discharge switches are indicated. Gas mixtures for possible use in externally sustained (e-beam) diffuse-discharge switches are suggested on the basis of electron attachment rate constants and electron drift velocities measured as a function of the density-normalized electric field E/N. Of particular promise are mixtures of Ar and C3F8. GRA

N86-20101# Minnesota Univ., Minneapolis. Dept. of Chemistry.
THE CONFERENCE ON THE DYNAMICS OF MOLECULAR COLLISIONS HELD AT SNOWBIRD, UTAH ON 14-19 JULY 1985 Final Report
Donald G. Truhlar Jul. 1985 246 p Conf. held at Snowbird, Utah, 14-19 Jul. 1985
(Grant AF-AFOSR-0124-85)
(AD-A161078; AFOSR-85-0930TR) Avail: NTIS HC A11/MF A01 CSCL 07/4

The research discussed at the conference included: reactive scattering studies with state selection and aligned reactants; reactive and nonreactive resonances; reactions of transition metal ions; reactive close coupling calculations and the distorted wave and quantal transition state theories of reactive scattering; potential energy surfaces; experimental studies of vibrational and rotational energy transfer collisions in the vapor and condensed phases, in ions in flow tubes, and at surfaces; collision-free energy transfer; infrared and visible fluorescence, theory and experiment for collisions of open-shell and electronically excited molecules; collisional interactions of molecules with surfaces; desorption; helium beam diffraction; and photodissociation. The plenary discussions following the lectures were exceptionally vital and provided a strong indication of the current excitement in this field. The posters covered an even broader spectrum of work on the dynamics of molecular collisions. GRA

N86-20102# Iowa State Univ. of Science and Technology, Ames.
STRUCTURE DETERMINATION OF MOLECULES OF BIOCHEMICAL INTEREST Final Report
Richard B. Honzatko Oct. 1985 6 p
(Contract N00014-84-G-0094)
(AD-A161119; FR-1) Avail: NTIS HC A02/MF A01 CSCL 06/1

In the past year we have established a new laboratory for the determination of macromolecular structure. Currently, facilities are in place for data collection, data processing, molecular modeling and X-ray refinement of structures of up to 100,000 molecular weight in their crystallographic asymmetric unit. In parallel with establishing a new laboratory, we have pursued structure investigations of hemoglobin from the sea lamprey, aspartate carbamoyltransferase from Escherichia coli and p-nitrobenzylidine aminoguanidine, a small molecule which is an acceptor of the adenosine diphosphate ribosyl group in an enzyme mediated reaction. In addition to the structural studies above we have made a theoretical study by techniques of energy minimization of possible modes of aggregation of lamprey hemoglobin and the relationship between aggregate formation and cooperativity expressed in solutions by lamprey hemoglobin. GRA

N86-20103# Rochester Univ., N. Y. Dept. of Chemistry.
THEORETICAL STUDIES OF LASER-INDUCED MOLECULAR RATE PROCESSES: TOPICS IN LINE BROADENING AND SPECTROSCOPY Final Report, 15 Nov. 1981 - 30 Sep. 1985
Thomas F. George Oct. 1985 20 p
(Grant AF-AFOSR-0046-82)
(AD-A161132; AFOSR-85-0929TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Theoretical studies of molecular rate processes were carried out, with an emphasis on how such processes can be induced or affected by external laser radiation. The processes were classified into two types: gas-phase processes and surface processes. Within the first type a variety of laser-assisted collisional processes were investigated, including chemical reactions in a laser field, laser-induced resonance scattering with applications to transition-state spectroscopy and line broadening in general, laser-induced curve switching, isotope separation by selective radiative scattering and laser-induced associative ionization. Several related problems not necessarily involving a laser field were investigated, such as fine-structure transitions in alkali-noble-gas collisions and nonlocal potentials in bound-continuum problems. In regard to the second-type of processes, the following dynamical processes were considered: electron transfer in positive-ion-surface collisions, where one-electron transfer leads to ion neutralization and two-electron transfer leads to negative-ion formation (the latter necessitates the inclusion of the Anderson correlation energy); surface-state excitation and laser-enhanced ion-semiconductor electron transfer; laser-induced electron-phonon processes on metal surfaces; formation of electron-hole pairs in a semiconductor by vibrationally-excited molecules; vibrational (both energy and phase) relaxation of a laser-excited adspecies; and laser-induced migration. Spectroscopic processes included resonance fluorescence of atoms near a metal surface and Stark quantum beats from beam-foil excited hydrogen atoms. GRA

N86-20104# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
IR OBSERVATIONS OF THE ETA (EXPERIMENTAL TEST ACCELERATOR) BEAM CHANNEL
D. L. McKenzie, R. P. Ditteon, E. N. Frazier, R. P. Giguere, and C. J. Rice 30 Sep. 1985 97 p
(Contract F04701-83-C-0084)
(AD-A161194; TR-0084A(5940-03)-1; SD-TR-85-73) Avail: NTIS HC A05/MF A01 CSCL 20/7

Aerospace Corporation scientists observed infrared radiation from the ETA beam channel in the wavelength range 0.65 to 14.4 micrometer on September 12 to 16, 1983. The data consisted of time profiles of radiation pulses from the beam channel, measured with a limiting time resolution of 100 nanoseconds. Isolation of spectral bands was achieved through the use of broadband filters and circular variable filters (CVF). The latter had resolution lambda/delta lambda = 50 to 100, where lambda is wavelength. A total of 1076 radiation pulses were recorded. The beam propagation tube was filled with either ambient laboratory air or synthetic (dry) air at pressures ranging from 0.05 Torr to 500 Torr. GRA

N86-20105# Brookhaven National Lab., Upton, N. Y.
MONONUCLIDIC ELEMENTS AND THE 1983 ATOMIC MASS TABLE OF A. H. WAPSTRA
N. E. Holden 1985 7 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001168; BNL-NCS-36955; CONF-8508138-11) Avail: NTIS HC A02/MF A01

During the last Atomic Weight's meetings in Lyngby, Denmark, there was a recommendation from the Subcommittee for the Assessment of Isotopic Composition, (SAIC), for a change in the treatment of uncertainties on atomic weight values from the pair (1,3) to any digit (1,9). This new treatment was adopted and with it a concern about treating the mononuclidic elements in a different manner from the polynuclidic elements. The reason for the difference is due to the fact that one is really accessing uncertainties on the isotopic composition in one case and uncertainties on nuclidic masses in the case of the mononuclidic elements. In the SAIC report on the Element-by Element Review, the present and preferred treatment of data on the mononuclidic elements are examined. For the past dozen years, the following rule has been applied to the nuclidic mass data for these elements. The uncertainty quoted in the atomic mass table is multiplied by

a factor of six. If the resulting digit is greater than unity, it is rounded up to one in the preceding digit. The atomic weight is always uncertain to one in the last quoted figure as a result. In 1983, the Commission appointed a working party to review this rule. As a result of a meeting at NBS last year, a new proposal is now being recommended. The factor of six will continue to be used, to account for systematic error (which is not considered in the mass table). However, the rounding up rule will be discontinued and the recommended standard atomic weights will carry uncertainties of from one to nine in the last quoted digit. This paper reviews the new proposed rule and makes some comments on the assumptions made during the discussions at the Lyngby meeting and at the meeting of the working party. DOE

N86-20106# Brookhaven National Lab., Upton, N. Y.
STATUS OF THE LANTHANIDES AND ACTINIDES IN THE PERIODIC TABLE
N. E. Holden 1985 3 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001188; BNL-NCS-36964; CONF-8508138-18) Avail: NTIS HC A02/MF A01

In extended discussions and correspondence with Ekkehard Fluck, the author was made aware of a problem with the Periodic Table, i.e., which element should be shown in the main table as the representative of the lanthanide series and the actinide series. In earlier discussion, he came to the conclusion that lanthanum and actinium are not the elements which should appear, but rather lutetium and lawrencium are more appropriate for inclusion in their place. This paper will attempt to justify the reasons for the above conclusions. DOE

N86-20107# Brookhaven National Lab., Upton, N. Y.
CORRELATED ELECTRON CAPTURE AND INNER-SHELL EXCITATION MEASUREMENTS IN ION-ATOM COLLISIONS
J. A. Tanis, E. M. Bernstein, M. W. Clark, W. G. Graham, R. H. McFarland, T. J. Morgan, A. Muller, M. P. Stockli, K. H. Berkner, and P. Gohil 1985 7 p refs Presented at the 14th International Conference on the Physics of Electronic and Atomic Collisions, Palo Alto, Calif., 24 Jul. 1985 Prepared in cooperation with Western Michigan Univ., Kalamazoo, New Univ. of Ulster, Coleraine, Northern Ireland, Missouri Univ., Rolla, Wesleyan Univ., Middletown, Conn., and Giessen Univ., West Germany
(Contract DE-AC02-76CH-00016)
(DE86-000030; BNL-36976; CONF-850701-3) Avail: NTIS HC A02/MF A01

In an ion-atom collision projectile excitation and charge transfer (electron capture) may occur together in a single encounter. If the excitation and capture are correlated, then the process is called resonant transfer and excitation (RTE); if they are uncorrelated, then the process is termed nonresonant transfer and excitation (NTE). Experimental work to date has shown the existence of RTE and provided strong evidence for NTE. Results presented here provide information on the relative magnitudes of RTE and NTE, the charge state dependence of RTE, the effect of the target momentum distribution on RTE, the magnitude of L-shell RTE compared to K-shell RTE, and the target Z dependences of RTE and NTE. DOE

N86-20070# Joint Publications Research Service, Arlington, Va.
LASING PROPERTIES OF TWO-COMPONENT DYE SOLUTION EMPLOYING FLASHLAMP PUMPING IN DIFFERENT SOLVENTS Abstract Only
A. M. Saletskiy and V. I. Yuzhakov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 38 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 2, Feb. 1985 p 294-305 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20081# Joint Publications Research Service, Arlington, Va.
KINETIC COOLING IN BINARY MIXTURES OF MOLECULAR GASES DURING TWO-QUANTUM EXCHANGE OF OSCILLATING ENERGY Abstract Only
U. S. Dzhurabekov and A. I. Osipov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 77 Transl. into ENGLISH from Vestnik Moskovskogo Univ.: Seriya 3 Fizika, Astronomiya (Moscow, USSR), v. 25, no. 6, Nov. - Dec. 1984 p 44-47 Original language document was announced in IAA as A85-24059 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N86-20108# Kema N.V., Arnhem (Netherlands). Dept. of Technological Development.
RESEARCH ON TREATMENT OF RADIOACTIVE WASTE
J. Kuypers, ed. and A. J. vanLoon, ed. 1985 34 p refs
(S/T-Rept-Vol-3-No-1; ISBN-90-353-0024-6; ISSN-0167-8590; B8566386) Avail: NTIS HC A03/MF A01

Techniques for volume reduction and immobilisation of radioactive wastes from nuclear power plants are described. A cyclone incinerator is presented, and its control system is outlined. For individual titles, see N86-20109 through N86-20112.

N86-20109# Kema N.V., Arnhem (Netherlands). Dept. of Technological Development.
OVERVIEW OF TECHNIQUES FOR VOLUME REDUCTION AND IMMOBILIZATION OF RADIOACTIVE WASTE, AS INVESTIGATED AT KEMA
J. Kuypers, J. L. Matteman, and A. J. vanLoon *In its* Research on Treatment of Radioactive Waste 1985 p 3-9 refs Presented at Symposium on Radioactive Waste in the Netherlands, 's-Gravenhage, The Netherlands, 24 Oct. 1984; organized by Royal Inst. of Engineers (KIVI), Netherlands Energy Research Foundation and Netherlands Nuclear Society (For primary document see N86-20108 10-73)
Avail: NTIS HC A03/MF A01

Measures to decrease the amount of radioactive waste generated by power plants, to decontaminate active material, and to reduce the final volume of the waste, e.g., by incineration or acid digestion are reviewed. Organic radioactive wastes from nuclear power plants are treated adequately: only inorganic end-products remain, and they have a relatively small volume and are immobilized. Chemical, biological, and alteration processes therefore do not significantly increase the risk of storage, even if water intrudes the storage facility. The considerable volumes of activated and/or contaminated metal that remain after repair or decommissioning of the plants could be treated. Decontamination and melting may significantly reduce the volume of the final waste. It seems probable that estimates of waste volumes are too pessimistic, and relatively small storage facilities will be sufficient. Waste in those facilities presents unacceptable risk for the biosphere during the period it is considered as radioactive.
Author (ESA)

N86-20110# Kema N.V., Arnhem (Netherlands).
TREATMENT OF PLANT-PROCESS WASTE AT THE DODEWAARD (NETHERLANDS) NUCLEAR POWER PLANT
J. Hoekstra and W. H. M. Nissen *In* Kema N.V. Research on Treatment of Radioactive Waste 1985 p 11-18 refs Presented at Symposium on Radioactive Waste in the Netherlands, 's-Gravenhage, The Netherlands, 24 Oct. 1984; organized by Royal Inst. of Engineers (KIVI), Netherlands Energy Research Foundation and Netherlands Nuclear Society (For primary document see N86-20108 10-73)
Avail: NTIS HC A03/MF A01

Methods to treat plant-process waste from a boiling-water reactor (liquid and solid materials) are described. Methods to

dispose of this waste include solidification of the liquid waste, and packaging and compression of the solid waste to reduce the final waste volume. A procedure to pack the waste in containers by remote control in a so-called concreting train was developed. The effective dose equivalent for the employees involved remains low. High-level activated waste is also dealt with in lead containers (200 liters) placed inside standard concrete containers. Measurements, combined with calculations, resulted in an optimization of the package procedure; the results are demonstrated by comparison of the data from two treatment courses. Author (ESA)

N86-20111# Kema N.V., Arnhem (Netherlands). Dept. of Technological Development.
EXPERIMENTS WITH THE KEMA CYCLONE INCINERATOR FOR RADIOACTIVE WASTE
J. L. Matteman and P. Tigchelaar *In its* Research on Treatment of Radioactive Waste 1985 p 19-24 refs Presented at Seminar on Incineration of Radioactive Wastes, Arnhem, The Netherlands, 24 Oct. 1984; organized by Commission of European Communities and Kema N.V. (For primary document see N86-20108 10-73)
Avail: NTIS HC A03/MF A01

A cyclone incinerator for the treatment of solid waste at a nuclear power station was developed to reduce volume and weight of the final waste; reductions by factors of 7 and 80 respectively are possible (after solidification). For burnable waste the throughput is 23 kg/hr for 6 hr runs. About 7000 kg of nonradioactive waste were treated in total. The behavior of potentially dangerous radionuclides (Co, Cs, Mn and Sr) was studied by tracers. It appears that Co, Mn and Sr are concentrated in the resulting ashes, where 55% of the Cs is also found; the remaining Cs is unaccounted for. The ashes were solidified by mixing them with concrete in a 1:1 ratio. Due to the flexibility of the facility, start-up and turn-down periods are short. Since the process can be controlled automatically, the operation can be run by one employee, to load the waste and handle the ashes. Author (ESA)

N86-20112# Kema N.V., Arnhem (Netherlands). Dept. of Technological Development.
AUTOMATION AS A TOOL FOR SAFE AND DISCONTINUOUS OPERATION OF THE KEMA INCINERATOR
R. H. J. Beuse, J. J. vanDoorn, A. H. Eenink, and B. M. G. Gersten *In its* Research on Treatment of Radioactive Waste 1985 p 25-31 refs Presented at Seminar on Incineration of Radioactive Waste, Arnhem, Netherlands, 25-26 Sep. 1984; organized by Commission of European Communities and Kema N.V. (For primary document see N86-20108 10-73)
Avail: NTIS HC A03/MF A01

An automatic control system was developed and implemented for a nuclear waste disposal cyclone-type incinerator. The process analysis and the development of a control program required to obtain carbon-free ashes and clean flue gases are described. Automatic control allows the incinerator to burn solid low-level waste of various compositions and to be easily handled by one operator. Author (ESA)

N86-20113# Maryland Univ., College Park. Div. of Mathematical and Physical Sciences and Engineering.
PROPAGATION OF INTENSE CHARGED PARTICLE BEAMS INTO VACUUM Annual Progress Report, 1 Apr. 1984 - 31 Mar. 1985
W. W. Destler, M. P. Reiser, M. J. Rhee, and C. D. Striffler 31 Mar. 1985 82 p
(Grant AF-AFOSR-0091-84)
(AD-A160343; AFOSR-85-0854TR) Avail: NTIS HC A05/MF A01 CSCL 20/7

During the past year the experimental facilities have been augmented by the construction of a large diameter (60cm) vacuum chamber with and array of radial current collectors to support detailed studies of beam propagation characteristics, and a new pulsed magnetic field coil (surplus) from the Autoresonant Acceleratoar project. This new coil provides much more uniform fields over a longer axial length than did the previous coils. In addition, a Department of Defense University Instrumentation award is currently being used to construct a completely digital fast data acquisition system. This system, currently under installation in a special shielded room in the laboratory, will allow much greater flexibility in the manner in which we acquire and process data and hopefully will eventually reduce the yearly expenditures for Polaroid oscilloscope camera film. Author (GRA)

N86-20114# KM Sciences, Arlington, Va.
RADIATION EFFECTS PROGRAM Final Report, 1 Jul. 1984 - 13 Sep. 1985
13 Sep. 1985 17 p
(Contract N00014-84-C-2230)
(AD-A161000) Avail: NTIS HC A02/MF A01 CSCL 20/7

No existing LINAC Based Beam Heating facility comes within a factor of ten of the needs of a high heating rate thermodynamic properties research facility. The facility could be built at the Naval Research Lab. for a cost in the neighborhood of 2 million dollars. The 10 MeV electron beam would not produce any serious radioactivity but would provide unprecedented beam power for such other applications as food processing, sewer treatment, materials curing, radiation hardness assurance, etc. One can always achieve lower current densities by scattering the beam and moving the device under test further away from the scatterer. In this case one must rely on the TLD readings to indicate the dose rate at the point of interest. For general utility with the beam covering about four TLD's fairly evenly one can claim that the NRL LINAC can produce a maximum dose rate of about 6 x 10 to the 10th power rads (Si) per second for a pulse length of 1.5 microseconds, and about 1.4 x 10 to the 11th power rads (Si) per second in a 50 nanosecond pulse. In both cases the beam area is about 0.4 square centimeters. GRA

N86-20115# Lawrence Livermore National Lab., Calif.
CBEAM.2-D: A TWO-DIMENSIONAL BEAM FIELD CODE
K. A. Dreyer May 1985 29 p
(Contract W-7405-eng-48)
(DE86-000834; UCID-20500) Avail: NTIS HC A03/MF A01

The CBEAM.2-D is a two-dimensional solution of Maxwell's equations for the case of an electron beam propagating through an air medium. Solutions are performed in the beam-retarded time frame. Conductivity is calculated self-consistently with field equations, allowing sophisticated dependence of plasma parameters to be handled. A unique feature of the code is that it is implemented on an IBM PC microcomputer in the BASIC language. Consequently, it should be available to a wide audience. DOE

N86-20116# Wisconsin Univ., Madison. Dept. of Medical Physics.
EXTENSION OF CARBON KERMA FACTOR MEASUREMENTS TO 18- AND 20-MeV NEUTRON ENERGY
P. M. DeLuca, Jr., H. H. Barschall, M. Burhoe, and R. C. Haight 1985 18 p refs Prepared in cooperation with Lawrence Livermore National Lab., Calif.
(Contracts W-7405-eng-48; DE-FG02-84ER40183; DE-AC02-76EV-01105)
(DE86-000845; DOE/EV-01105/320) Avail: NTIS HC A02/MF A01

Carbon kerma factor measurements were extended to neutron energies of 18 to 20 MeV. Contributions to the data of low energy interactions are identified and subsequently factored out. DOE

N86-20117# Brookhaven National Lab., Upton, N. Y.
RADIATION EFFECTS
N. E. Holden 1985 3 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001166; BNL-NCS-36966; CONF-8508138-12) Avail: NTIS HC A02/MF A01

For the meeting of the Commission on Radiochemistry and Nuclear Techniques our chairman has submitted comments on potential problems that the Commission should consider in Lyon which had been posed by various members. In one of these

comments, Prof. Roth has mentioned the problem of radiation effects in solids and in water and water solutions. The radiolysis of water has been of concern for a large number of years, but as Prof. Roth notes, the radiation effects on the first wall of fusion reactors is a problem that has arisen only in recent years and for which no critical data compilation is presently available. This paper has been prepared in response to Prof. Roth's comments and indicates a possible area, which the Commission might conceivably address at this meeting and/or in the near future. DOE

N86-20118# Brookhaven National Lab., Upton, N. Y.
POLARIZED PROTONS FROM THE SOURCE TO 70 GeV
Y. Makdisi, I. 1985 7 p Presented at the Workshop on Polarized Beams at the SSC, Ann Arbor, Mich., 10 Jun. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001184; BNL-37079; CONF-8506173-3) Avail: NTIS HC A02/MF A01

This energy range covers the current project at the AGS and extends well beyond it. I shall report on our learning experience at BNL, discuss the potential for improvement, and the limitations of extending the AGS resonance jumping technique beyond 25 GeV. DOE

N86-20119# Brookhaven National Lab., Upton, N. Y.
LIMITS ON LIKESIGN DILEPTON PRODUCTION IN (NU)/SUB (MU)/ INTERACTIONS
N. J. Baker 22 Aug. 1985 7 p Presented at the International Symposium on Multiparticle Dynamics, Kiryat Anavim, Israel, 1 Jun. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001203; BNL-36996; CONF-8506194-5) Avail: NTIS HC A02/MF A01

We have searched for the production of likesign dilepton events (n sub micron + Ne yields micron sup minus + e sup minus +...) in a wideband neutrino beam at Fermilab using the 15-ft bubble chamber. We observe no signal above the background arising from conventional sources. We set 90% confidence level upper limits for the production rates of (Nu sub micro + Ne yields micron sup minus + e sup minus +...)/(Nu sub micron + Ne yields micron sup minus +...) < 0.76 x 1/1000 and (Nu sub micron + Ne yields micron sup minus + e sup minus +...)/(Nu sub micron + Ne yields micron sup minus + e sup plus +...) < 5.3 x 1/100. DOE

N86-20120# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-H.
THE QCD RADIATIVE CORRECTIONS TO THE DECAY W YIELDS qq-bar GAMMA
J. A. M. Vermaseren Jun. 1985 18 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(Grant NSF PHY-81090110-A-03)
(NIKHEF-H/85-9; B8570058) Avail: NTIS HC A02/MF A01

The complete order alpha sub S QCD corrections to the rate and the Dalitz plot for W yields qq-bar gamma are presented. The way in which these corrections modify the factorization property of the lowest order decay rate is discussed. Author (ESA)

N86-20071# Joint Publications Research Service, Arlington, Va.
BEAM EXTRACTION FROM HIGH ENERGY CYCLOTRONS BASED ON INTEGER RESONANCE Abstract Only
L. A. Sarkisyan *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 39 Transl. into ENGLISH from Vestnik Moskovskogo Univ.: Seriya 3 Fizika, Astronomiya (Moscow, USSR), v. 25, no. 6, Nov. - Dec. 1984 p 59-61 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

74 OPTICS

Includes light phenomena.

N86-20121 Carnegie-Mellon Univ., Pittsburgh, Pa.
A NON-CONTACT OPTICAL PROXIMITY SENSOR OR MEASURING SURFACE SHAPE Ph.D. Thesis
Michael Gilbert Fuhrman 1985 115 p
Avail: Univ. Microfilms Order No. DA8517520

A noncontact multi-light source optical promixity sensor that can measure the distance, orientation, and curvature of a surface has been developed. Beams of light are sequentially focused from light emitting diodes onto a target surface. An analog light sensor--a planar PIN diode--localizes the position of the resultant light spot in the field of view of the sensor. The 3-D locations of the light spots are then computed by triangulation. The distance, orientation, and curvature of the target surface is computed by fitting a surface to a set of data points on the surface. In designing the proximity sensor, a geometrical model of the sensor was first developed. This model relates the uncertainty in the measurement of surface orientation with the spatial distribution of the data points on the target surface and with the uncertainty in the measurement of their position. This model was used as a guide to determine the number of light sources, and their positions and orientations.
Dissert. Abstr.

N86-20122 Missouri Univ., Rolla.
MEASUREMENT OF THE FAR INFRARED OPTICAL PROPERTIES OF STEEL, ALUMINUM, EVAPORATED IRON, AND TEFLON FEP Ph.D. Thesis
Raymond Edward Paul 1985 169 p
Avail: Univ. Microfilms Order No. DA8516297

The optical properties of low carbon shim steel, aluminum foil, and Teflon FEP were measured in the 20/cm to 70/cm range. In particular, measurements of surface impedance for aluminum and low carbon steel were used to calculate the imaginary part of the dielectric constant (E sub m,2). The resulting values of E sub m,2 were of order 100,000 for aluminu, and 10000 for steel. The imaginary part of the dielectric constant for metals is several times greater in magnitude than the real part in the frequency range of this experiment. Calculations of E sub m,2 obtained by a different method (Drude model prediction yielded results that were within 50% of the measured values of E sub m,2. In addition to the observed magnitude of E sub m,2 the Drude model frequency dependence for E sub m,2 was observed. Measurements of intenity/absorption per unit length for Teflon FEP are shown.
Dissert. Abstr.

N86-20123 Arizona Univ., Tucson.
DIGITAL HETERODYNE TOPOGRAPHY Ph.D. Thesis
Bernard White Bell, Jr. 1985 200 p
Avail: Univ. Microfilms Order No. DA8517489

Digital heterodyne methods are employed in conjunction with periodic fringe projection to produce a fast automated surface relief measurement technique. A method of sampling the image with a solid state detector array produces a moire fringe image free of the noise terms normally present with moire techniques is presented along with an extension to Whittaker-Shannon sampling theory to cover the moire aliasing phenomena. The limitations imposed on the surface slopes by the requirement that the properly moire sampled image spectra must be confined to a moire interval are given. Moire sampling allows an optical processing step (removal of the reference surface tilt), while classical nonaliased sampling produces the same information with respect to a tilted surface. General additive noise is analyzed as regards both integrating bucket and phase stepping algorithms. A phase averaging technique which eliminates oscillatory errors as well as those caused by reference phase shift errors in all the algorithms is demonstrated. Dissert. Abstr.

N86-20124* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPECTRAL SLICING X-RAY TELESCOPE WITH VARIABLE MAGNIFICATION Patent
Richard B. Hoover and Ernest Hildner, inventors (to NASA) Issued 31 Dec. 1985 9 p Filed 17 Jan. 1984

(NASA-Case-MFS-25942-1; US-Patent-4,562,583;
US-Patent-Appl-SN-571613; US-Patent-Class-378-43;
US-Patent-Class-378-85) Avail: US Patent and Trademark Office

A telescope for viewing high frequency radiation (soft X-ray, extreme ultraviolet) is described. This telescope has a long focal length with a selection of magnifications despite a short housing. Light enters the telescope and is reflected by the telescope's primary optical system to one of several secondary mirrors at different locations on a movable frame. The secondary mirrors have varying degrees of magnification and select narrow spectral slices of the incident radiation. Thus, both the magnification and effective focal length field of view and wavelength can be altered by repositioning the moving frame. Configurations for spaceborne applications are discussed.

Official Gazette of the U.S. Patent and Trademark Office

N86-20125* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

OPTICAL SYSTEM WITH REFLECTIVE BAFFLES Patent

William I. Linior, inventor (to NASA) Issued 24 Sep. 1985 8 p Filed 28 Mar. 1984
(NASA-Case-ARC-11502-1; US-Patent-4,542,963;
US-Patent-Appl-SN-594134; US-Patent-Class-350-537;
US-Patent-Class-350-276-R; US-Patent-Class-350-319;
US-Patent-Class-350-448; US-Patent-Class-350-580) Avail: US Patent and Trademark Office CSCL 20F

This invention relates to an optical system incorporating a plurality of reflective baffles which return incoming off-axis rays from the optical system. The baffles in an infrared telescope would extend circumferentially around the telescope tube. Each of the baffles has a concave, rearwardly facing curved surface and a frontwardly facing planar surface. Baffles extend from the interior wall of tube in an acute angle with the optical axis of the telescope, relative to front end of the tube. This acute angle becomes greater for the baffles toward rear end of the telescope. Incoming off axis rays are reflected by the planar surface of the baffles against the curved surface of a forward adjacent baffle and are reflected back and forth between adjacent surfaces a number of times before being reflected back as rays out of the front end of the telescope. Other off axis rays are directly reflected as rays by the planar surfaces of the baffles. M.G.

N86-20126* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

X-RAY DETERMINATION OF PARTS ALIGNMENT Patent

Charles W. Nelson (Beech Aircraft Corp., Boulder, Colo.) Issued 17 Sep. 1985 4 p Sponsored by NASA
(NASA-Case-MSC-20418-1; US-Patent-4,542,520;
US-Patent-Appl-SN-438446; US-Patent-Class-378-58;
US-Patent-Class-378-59) Avail: US Patent and Trademark Office

A method for determining the alignment of adjoining metal objects is provided. The method comprises producing an X-ray image of adjoining surfaces of the two metal objects. The X-ray beam is tangential to the point the surfaces are joined. The method is particularly applicable where the alignment of the two metal objects is not readily susceptible to visual inspection.

Official Gazette of the U.S. Patent and Trademark Office

N86-20127 Department of the Navy, Washington, D. C.

TRIAXIAL OPTICAL FIBER SYSTEM FOR MEASURING MAGNETIC FIELDS Patent

L. C. Bobb, inventor (to Navy) Issued 22 May 1984 7 p Supersedes AD-D010247
(AD-D011941; US-Patent-4,450,406; US-Patent-Appl-SN-308310;
US-Patent-Class-324-247) Avail: US Patent and Trademark Office

This patent discloses an optical system wherein light is transmitted through fiber optic members orthogonally configured in a triaxial arrangement for measuring the magnetic field vector preset in the environment. In one preferred embodiment, a set of three fiber optic coils positioned coaxially along respective orthogonal axes and having predetermined lengths and diameters are coupled to a source of polarized light for transmitting the light subject to Faraday rotation of its plane of polarization. In another preferred embodiment, light, not necessarily polarized, is transmitted along respective orthogonal axes through a set of three bifurcated fiber optic cables each formed having a reference branch on which a magnetostrictive material is intimately connected to produce optical path length changes related to the magnetic field component along the respective axes. Photodetectors are used in both embodiments to produce current signals indicative of characteristic changes in the transmitted light, and the current signals are digitally processed to provide magnitude and directional information regarding the magnetic field vector. GRA

N86-20128*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A METHOD AND APPARATUS FOR MAKING AN OPTICAL ELEMENT HAVING A DIELECTRIC FILM Patent Application

Gordon C. Augason, inventor (to NASA) Filed 15 Aug. 1985 16 p
(NASA-CASE-ARC-11611-1; NAS 1.71:ARC-11611-1;
US-Patent-Appl-SN-765981) Avail: NTIS HC A02/MF A01 CSCL 20F

A film-application device (FAD) comprising a pair of exterior, tapered, O ring bearing plate members and a central plate member for simplifying the process of thermally bonding a thin dielectric film to a substrate comprising an optical element are discussed. In use, the film is sandwiched between the O rings and stretched across the optical element by squeezing the exterior plates together before bonding to the element. The film may be used for protecting the optical element or to reduce surface reflection of radiation. The FAD may also be used without the center plate to stretch a dielectric film prior to its attachment to or insertion in a holder to make pellicles or beam-splitters. NASA

N86-20129*# National Aeronautics and Space Administration. Pasadena Office, Calif.

CLOSED LOOP FIBER OPTIC ROTATION SENSOR Patent Application

W. C. Goss (JPL, Pasadena, Calif.), B. R. Youmans (JPL, Pasadena, Calif.), N. M. Nerheim, inventors (to NASA) (JPL, Pasadena, Calif.), and R. K. Bartman Filed 10 Sep. 1985 22 p
(Contract NAS7-918)
(NASA-Case-NPO-16558-1-CU; NAS 1.71:NPO-16558-1-CU;
US-Patent-Appl-SN-779744) Avail: NTIS HC A02/MF A01 CSCL 20F

An improved optical gyroscope is provided, of the type that passes two light components in opposite directions through an optic fiber coil, and which adds a small variable frequency to one of the light components to cancel the phase shift due to rotation of the coil. The amount of coil rotation from an initial orientation, is accurately determined by combining the two light components, one of which has a slightly increased frequency, to develop beats that each represent a predetermined angle of rotation. The direction of rotation is obtained by combining the two light components on a photodetector, intermittently phase shifting a single light component by 90 deg, and comparing the direction of change of photodetector output (+ or -) caused by the 90 deg shift, with the slope (+ or -) of the photodetector output at about the same time, when there is a 90 deg shift. NASA

N86-20130*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

WELDING TORCH ARC LIGHT REFLECTOR Patent Application

Stephen S. Gordon, inventor (to NASA) (Rockwell International Corp., Canoga Park, Calif.) Filed 3 Oct. 1985 8 p
(NASA-Case-MFS-29134-1; NAS 1.71:MFS-29134-1;
US-Patent-Appl-SN-783890) Avail: NTIS HC A02/MF A01 CSCL 20F

A welding torch arc light reflector is disclosed for welding torches having optical viewing systems. A schematic of a welding torch having an internal coaxial viewing system consisting of a lens which focuses the field of view of the weld scene of the workpiece onto the end of the fiberoptic bundle is provided. The

transmitted image of the fiberoptic bundle is provided to a camera lens which focuses it onto a TV sensor array for transmission. To improve the parity of the image of the monitoring system, an arc light reflector is shown fitted to the end of the torch housing or gas cup. The arc light reflector has an internal conical section portion which is polished to serve as a mirror which reflects the bright arc light back onto the darker areas of the weld area and thereby provide a more detailed image for the monitoring system. The novelty of the invention lies in the use of an arc light reflector on welding torches having optical viewing systems. NASA

N86-20131# Royal Signals and Radar Establishment, Malvern (England).
APPLICATION OF PHASE CONJUGATION TO IMAGE AND SIGNAL PROCESSING
C. L. West Jul. 1985 63 p refs
(AD-A160724; RSRE-MEMO-3856; BR96967) Avail: NTIS HC A04/MF A01 CSCL 20/6

Nonlinear optical phase conjugation is shown to possess a potential as the key element in adaptive optical systems with applications in optical computing, communications, lensless imaging, fusion, and real time image and temporal signal processing. These are optical interactions which occur in real time free from electromechanical components and electronic networks and can provide large spatial and temporal bandwidths. Major limitations to such a technique include the size of the phase conjugate element (limiting the size of phase point that can be compensated), the spread of response of the element, the need for coherence between interacting beams (not as critical for fast elements), the availability of the phase conjugating media in parts of the electromagnetic spectrum near visible wavelengths, and the nonideal performance of a phase conjugage mirror which does not exhibit unity gain. Author (ESA)

N86-20132# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PARTIALLY-COHERENT IMAGING WITH A MULTIAPERTURE OPTICAL SYSTEM Final Report, Jun. - Sep. 1985
J. P. Mills Sep. 1985 24 p
(AD-A159353; AD-E700020; AU-AFIT-EN-TR-85-6) Avail: NTIS HC A02/MF A01 CSCL 20/6

A theoretical analysis has been performed on the use of a six-element multi-aperture optical system for imaging of an incoherent object by sampling the degree of partial coherence of the optical field arriving at the multi-aperture system from the incoherent object. GRA

N86-20133# State Univ. of New York at Buffalo, Amherst. Dept. of Chemistry.
CONVERGENT LIGHT SCHEME FOR LIGHT SCATTERING FROM AN ARBITRARY DEEP METALLIC GRATING Interim Technical Report
Dan Agassi and Thomas F. George Nov. 1985 35 p
(Contract N00014-80-C-0472)
(AD-A161005; UBuffalo/DC/85/TR-70) Avail: NTIS HC A03/MF A01 CSCL 20/6

The justification of continuing the Rayleigh expansion to the grating's surface surface (the Rayleigh hypothesis) and its convergence properties are considered. A class of gratings for which the Rayleigh hypothesis is exact is identified, a prime example of which is the sinusoidal grating (SG). Based on identification of the origin of the limited stability of the Rayleigh expansion, a modified expansion is introduced, dubbed as the dressed Rayleigh expansion. This new expansion presumably has excellent convergence properties as explicitly demonstrated for the sinusoidal grating. The dimensionality N of the matrix which must be inverted for a SG of arbitrary depth g and periodicity d is found to be N approx. 8 g/d. GRA

N86-20134# National Bureau of Standards, Gaithersburg, Md.
OM85: BASIC PROPERTIES OF OPTICAL MATERIALS SUMMARIES OF PAPERS Final Report, 7 May - 1 Sep. 1985
Albert Feldman May 1985 88 p
(Grant AF-AFOSR-ISSA-85-00052)
(AD-A161247; NBS-SP-697; AFOSR-85-0902TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

The purpose of the conference is to bring together researchers from industry, academia, and government to discuss the physical and structural properties of optical materials as they affect optical performance. The scope of the confference includes the measurement and theory of basic properties in bulk and in thin film form and the dependence of these properties on atomic structure, morphological structure, impurity content, and inhomogeneity. GRA

N86-20135# Panametrics, Inc., Waltham, Mass.
THEORETICAL STUDY OF SINGLE AND MULTIPLE SCATTERING BY CYLINDERS Final Rpet. May 1983 - May 1984
Norman E. Pedersen, Jeanne C. Pedersen, and Peter C. Waterman Apr. 1985 92 p
(Contract DAAK11-83-C-0044)
(AD-A161251; CRDC-CR-85014) Avail: NTIS HC A05/MF A01 CSCL 20/8

Closed form analytic results are obtaned for the calculation of the electromagnetic differential and total scattering, absorption, and extinction cross sections of arbitrarily oriented conductive fibers. An extensive computer program has been developed for the computation of these quantities. The results agree with expectations for arbitrary conductivity, arbitrary length-to-wavelength ratio and radius-to-wavelength ratio less than 0.3. Two minor exceptions are noted and discussed. The albedo of the particle is computed as are the appropriately averaged differential scattering cross sections. These quantities serve as inputs to a Radiative Transfer computer program which was developed concurrently to calculate and plot the angular distributions of reflected and transmitted radiation from large aggregates of the particles. GRA

N86-20136# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF PARTICLE SIZE MEASUREMENT USING NON-INTRUSIVE OPTICAL TECHNIQUES IN A GAS TURBINE COMBUSTOR M.S. Thesis
John S. Bennett Sep. 1985 51 p
(AD-A161253) Avail: NTIS HC A04/MF A01 CSCL 21/4

This thesis investigated the use of three-wavelength light transmission and forward-angle scattered light intensity ratio techniques to determine the effects of fuel additives on particle sizes and mass concentrations in a T-63 combustor and evaluated several improvements to the T-63 diagnostic system. Data from both optical methods indicated an increase in particle size in a range of .06 to .10 microns occurred in the exhaust region when the fuel additive was used, with no change in mass concentration. The two techniques resulted in different measured particle sizes and require further investigation. Current improvements to the T-63 diagnostic apparatus are discussed along with required changes for further testing. GRA

N86-20137# National Bureau of Standards, Gaithersburg, Md.
OM85: BASIC PROPERTIES OF OPTICAL MATERIALS. SUMMARIES OF PAPERS Final Report
A. Feldman Apr. 1985 297 p Presented at the Topical Conference on Basic Properties of Optical Materials, Gaithersburg, Md., 7-9 May 1985; sponsored by AFOSR, Bolling, AFB, D.C. and American Physical Society, Ne.
(PB85-206324; NBS-SP-697; LC-85-600534) Avail: NTIS HC A13/MF A01 CSCL 20F

Papers on Basic Properties of Optical Materials are summarized. The physical and structural properties of optical materials as they affect optical performance are discussed. The scope of the conference includes the measurement and theory of basic properties of optical materials in bulk and in thin film form and the dependence of these properties on atomic structure, morphological structure, impurity content, and inhomogeneity. GRA

N86-20067# Joint Publications Research Service, Arlington, Va.
DYNAMIC CHARACTERISTICS OF ADAPTIVE OPTICS SYSTEMS

V. P. Lukin and V. L. Mironov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 28-32 refs Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 12, no. 9(159), Sep. 1985 p 1959-1961 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20073# Joint Publications Research Service, Arlington, Va.
ESTIMATION OF MINIMUM LIGHT FLUX DETERMINED BY PHOTON NOISE FOR ADAPTIVE IMAGE VIBRATION COMPENSATION SYSTEM Abstract Only
A. N. Bogaturov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 43 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorky, USSR), v. 27, no. 11, Nov. 1984 p 1410-1418 Original language document was announced in IAA as A85-20630 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20074# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF RELATIVE CURRENT DENSITY DISTRIBUTION IN POWERFUL PULSE ELECTRON BEAM BY PHOTOMETER REGISTRATION OF X-RAY BREMSSTRAHLUNG Abstract Only
A. A. Golubev, A. Kh. Kadymov, and O. I. Radkevich *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 45 Transl. into ENGLISH from Radioelekronika Uskoriteley I Fizicheskogo Eksperimenta (Moscow, USSR), 1982 p 11-21 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20075# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF A GARNET MAGNETIC MIRROR WITH WAVELENGTH OF 1.15 MICRON Abstract Only
I. A. Andronova, Yu. A. Gusev, Yu. N. Konoplev, M. A. Mamayev, M. A. Novikov, and A. A. Turkin *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 47 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy Mv I SSO SSSR: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 388-392 Original language document was announced in IAA as A85-34890 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20076# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF HOLOGRAM RECORDING IN IMPURITY CRYSTALS OF LITHIUM NIOBATE AT 325 nm Abstract Only
V. Yu. Kozlova and R. K. Ovsepyan *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 58 Transl. into ENGLISH from Doklady Akademii Nauk Armyanskoy SSR (Yerevan, USSR), v. 79, no. 5, Sep. - Oct. 1:9984 p 214-217 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N86-20138 Princeton Univ., N. J.
OPERATION OF THE MPD THRUSTER WITH STEPPED CURRENT INPUT Ph.D. Thesis
John William Barnett 1985 214 p
Avail: Univ. Microfilms Order No. DA8514054

A magnetoplasmadynamic (MPD) thruster was operated with stepped current pulses in order to investigate the sensitivity of its operation to nonconstant current input. The thruster terminal voltage lags the current increment by increasing times as the highest level of the stepped current pulse nears the onset condition. Magnetic field transients corresponding to the terminal voltage transients appear in the thruster exhaust. The magnetic field and terminal voltage equilibrations can be interpreted in terms of magnetic diffusion and convention processes. The time constants of equilibration are largest in the exhaust portion of the discharge. The transient thrust following a current step up is estimated to be below the quasi-steady thrust, while the transient thrust following a current step down is estimated to be above the quasi-steady thrust. Implications of the experimental studies for MPD thruster system design are discussed, focusing on the issues of anode design, propellant injection and criteria for the selection of an appropriate current input. Dissert. Abstr.

N86-20139 Louisiana State Univ., Baton Rouge.
CYCLOTRON RADIATION FROM MAGNETIC CATACLYSMIC VARIABLES Ph.D. Thesis
Paul Everett Barrett 1985 188 p
Avail: Univ. Microfilms Order No. DA8517723

The absorption coefficient for the ordinary and extraordinary modes of wave propagation are calculated for cyclotron radiation from hot magnetized plasmas (kT less than 50 keV). Two relativistic methods are used to calculate the absorption coefficients: the dielectric formulation and the single particle formulation. A nonrelativistic approximation which includes the effects of inverse-bremsstrahlung and Thomson scattering (collisions) is also made. The situations of radiative transfer for a homogeneous plasma, with large Faraday rotation, are solved, and simple analytic expressions for the Stokes parameters Q and V are derived in terms of the optical depths in both modes. The results are applied to the accretion columns of AM Herculis binaries. The inclusion of collisional effects in the nonrelativistic approximation reduces the amount of fractionally polarized light to levels which agree better with the observations. For small viewing angles with the magnetic field, the circular polarization does not approach 100% as is observed in the relativistic calculations without the effects of collisions. Dissert. Abstr.

N86-20140 Alabama Univ., Huntsville.
MHD DESCRIPTION OF THE CONFINEMENT OF LIQUID METALS: A CONTAINERLESS PROCESS IN A MICROGRAVITY ENVIRONMENT Ph.D. Thesis
Charles Franklin Schafer 1985 133 p
Avail: Univ. Microfilms Order No. DA8519069

The term containerless processing is applied to the act of holding a material in position without contact with a substantial container while using the material for some scientific, engineering, or industrial purpose. These purposes are those which require isolation from contamination effects, nucleation sites, or other perturbing effects of a container. A means of positioning conducting samples for containerless processing is through application of an alternating magnetic field which has the proper geometry to produce a three dimensional potential well. This is a technique which has been successfully used to levitate small metal samples electromagnetically against gravity. Much larger specimens could be processed if the influence of gravity could be removed or diminished by the several orders of magnitude possible in a spacecraft in earth orbit. Small restraining forces will still be necessary. Containerless processing experiments involving electromagnetic levitation of conducting liquids are being planned which will be conducted in orbital spacecraft. Dissert. Abstr.

N86-20141*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
RF WAVE OBSERVATIONS IN BEAM-PLASMA DISCHARGE Final Report
William Bernstein 11 Feb. 1986 170 p refs
(Grant NAGw-69)
(NASA-CR-176574; NAS 1.26:176574) Avail: NTIS HC A08/MF A01 CSCL 20I

The Beam Plasma Discharge (BPD) was produced in the large vacuum chamber at Johnson Space Center (20 x 30 m) using an energetic electron beam of moderately high perveance. A more complete expression of the threshold current I sub c taking into account the pitch angle injection dependence is given. Ambient plasma density inferred from wave measurements under various beam conditions are reported. Maximum frequency of the excited

RF band behaves differently than the frequency of the peak amplitude. The latter shows signs of parabolic saturation consistent with the light data. Beam plasma state (pre-BPD or BPD) does not affect the pitch angle dependence. Unexpected strong modulation of the RF spectrum at half odd integer of the electron cyclotron frequency (n + 1/2)f sub ce is reported (5 < n < 10). Another new feature, the presence of wave emission around 3/2 f sub ce for I sub b is approximate I sub c is reported. Author

N86-20142# Science Applications International Corp., McLean, Va.
DYNAMICS OF HIGH TEMPERATURE PLASMAS Final Report
D. Dialetis, J. Finn, H. Freund, A. Mondelli, and E. Ott 1 Oct. 1985 256 p
(Contract N00014-83-C-2138)
(AD-A161202; SAIC-85/1846) Avail: NTIS HC A12/MF A01 CSCL 20/9

High temperature dynamics are described. The following topics are discussed: envelope model for beam transport and focusing in an induction linac; high-current accelerators; free-electron laser studies; laser beat wave particle acceleration; orbitron maser design; electron beam stability in the modified betatron; relativistic electron beam diode design; free electron laser application to XUV production and particle acceleration; high-current betatron with stellarator fields; A bumpy-torus betatron; design and operation of a collective millimeter-wave free-electron-laser; study of gain, bandwidth, and tunability of a millimeter-wave free-electron laser operating in the collective regime; nonlinear analysis of free-electron-laser amplifiers with axial guide fields; unstable electrostatic beam modes in free-electron-laser Systems; Three-Dimensional Theory of Free Electron Lasers with an axial guide field; three-dimensional theory of the free-electron laser in the collective regime; rapid electron beam accelerators; excitation of the plasma waves in the laser beat wave accelerator; dynamics of space-charge waves in the laser beat wave accelerator; finite larmor radius diocotron instability; one dimensional models for relativistic electron beam diode design; collective instabilities and high-gain regime in a free electron laser; and free electron lasers for the XUV spectral region. GRA

N86-20143# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
MIT 12 TESLA COIL TEST RESULTS
M. M. Steeves and M. O. Hoenig Jul. 1985 136 p
(Contract DE-AC02-78ET-51013)
(DE86-001110; DOE/ET-51013/155; PFC/RR-85-12) Avail: NTIS HC A07/MF A01

Test results from the MIT 12 Tesla Coil experiment are presented. The coil was tested in the High Field Test Facility (HFTF) of the Lawrence Livermore National Laboratory in October 1984 and January 1985. The experiment measured the performance of an Internally Cooled, Cabled Superconductor (ICCS) of practical size, intended for use in magnetic fusion experiments. The MIT coil carried 15 kA at 11 T for 5 min with no sign of instability. A half turn length in a 10 T field was able to absorb a heat load in 4 msec of more than 200 mJ sub cm of cable volume while carrying a current of 12 kA. The MIT coil successfully met the performance requirements of the Department of Energy's 12 Tesla Coil Program. DOE

N86-20144# Sandia National Labs., Albuquerque, N. Mex.
SIMULATOR BEAM CONTROL BY GRAD B DRIFT
J. R. Lee 1985 51 p Presented at the 6th JOWOG Meeting, Aldermaston, England, 7 Oct. 1985
(Contract DE-AC04-76DP-00789)
(DE86-001265; SAND-85-2126C; CONF-8510165-2) Avail: NTIS HC A04/MF A01

This paper presents theoretical analyses of three subjects pertinent to electron beam experiments. First, a new technique for injecting a beam from a triaxial diode is described, and calculations of the phase space acceptance are shown. Second, the interaction of a relativistic electron beam with a low pressure nitrogen gas in a strong magnetic field is discussed in detail. Calculation of the important parameters of the plasma generated by the beam leads to estimates of energy lost by beam electrons during transport. Third, pulse shaping is discussed. To first order, the risetime of the electron beam current after transport is infinitesimally small. Practical limits on the current risetime come from several second order effects, which are considered. DOE

N86-20061# Joint Publications Research Service, Arlington, Va.
INTERACTION OF CHARGED PARTICLE BEAMS WITH ACTIVE PLASMA MEDIUM Abstract Only
M. B. Bondarenko, A. N. Kondratenko, and V. I. Tkachenko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 6 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorky, USSR), v. 27, no. 11, Nov. 1984 p 1382-1387 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20069# Joint Publications Research Service, Arlington, Va.
COLLECTIVE EFFECTS DURING INDUCED RADIATION OF ELECTRON BEAM IN WIGGLER WITH AXIAL MAGNETIC FIELD Abstract Only
A. Kolomenskiy and I. I. Pakhomov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 37 Transl. into ENGLISH from Fizika Plazmy (Moscow, USSR), v. 10, no. 6, Nov. - Dec. 1984 p 1275-1279 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20072# Joint Publications Research Service, Arlington, Va.
INITIAL EXPERIMENT ON HIGH FREQUENCY PLASMA HEATING AT TUMAN-3 TOKAMAK Abstract Only
L. G. Askinazi, V. Ye. Golant, S. G. Goncharov, M. P. Gryaznevich, V. K. Lusev, V. V. Dyachenko, A. B. Izvozchikov, A. I. Kislyakov, S. V. Krikunov, and S. V. Lebedev *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 40 Transl. into ENGLISH from Pisma V Zhurnal Tekhnicheskoy Fiziki (Leningrad, USSR), v. 11, no. 5, 12 Mar. 1985 p 315-318 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20077# Joint Publications Research Service, Arlington, Va.
NUMERICAL MODELING OF TWO-DIMENSIONAL LANGMUIR TURBULENCE Abstract Only
L. M. Degtyarev, I. M. Ibragimov, R. Z. Sagdeyev, G. I. Solovev, V. D. Shapiro, and V. I. Shevchenko *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 60 Transl. into ENGLISH from Pisma V Zhurnal Eksperimentalnoy I Teoreticheskoy Fiziki (Moscow, USSR), v. 40, no. 11, 10 Dec. 1984 p 455-459 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20078# Joint Publications Research Service, Arlington, Va.
HIGH FREQUENCY PLASMA HEATING AT FINITE PRESURE IN REGION OF ION CYCLOTRON FREQUENCIES Abstract Only
D. L. Grekov and K. N. Stepanov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 61 Transl. into ENGLISH from Fizika Plazmy (Moscow, USSR), v. 10, no. 6, Nov. - Dec. 1984 p 1211-1218 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20079# Joint Publications Research Service, Arlington, Va.
EMISSION OF ELECTROMAGNETIC WAVES BY A MODULATED ELECTRON BEAM IN A RECTANGULAR WAVE GUIDE FILLED WITH A LONGITUDINALLY INHOMOGENEOUS PLASMA Abstract Only
S. M. Levitskiy and I. A. Anisimov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 64 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy MV I SSO SSSR: Radiofizika (Gorkiy, USSR), v. 28, no. 3, Mar. 1985 p 298-302 Original language document was announced in IAA as

A85-34880 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N86-20145 Polytechnic Inst. of New York, Brooklyn.
PHOTOEMISSION AND X-RAY ABSORPTION STUDIES OF INTERMETALLIC COMPOUNDS BASED ON THE EARLY RARE EARTHS Ph.D. Thesis
Yi-Shung Chaug 1985 94 p
Avail: Univ. Microfilms Order No. DA8515854

The general motivation for this thesis was to better understand the 4f instability in Cerium-based systems and hybridization effects involving the 4f electrons in Pr- and Nd- as well as Ce-based systems, by applying X-ray photoelectron spectroscopy, resonant photoelectron spectroscopy and X-ray absorption spectroscopy. The result of an ancillary study, not directly relevant to the main theme of the thesis is reported which addresses the problem of chemisorption-induced surface disproportionation in ReNi5, Re-=La, Pr and Nd, a subject of current interest in catalysis and hydrogen storage problem. Deep-core XPS studies on ReRu2 and ReIr2 systems, Re = La, Ce, Pr and Nd, show that there can be appreciable but decreasing intensity of the shake-down satellite in the 3d-XPS spectrum in going from La to Nd. The hybridization between the 4f electrons and the conduction electrons in the presence of a deep core hole has been deduced from the relative intensity of the shakedown satellite. Dissert. Abstr.

N86-20146 Lehigh Univ., Bethlehem, Pa.
THE DONOR LEVELS OF THE VACANCY IN SILICON: A NEGATIVE-U SYSTEM Ph.D. Thesis
James Lyle Newton 1985 225 p
Avail: Univ. Microfilms Order No. DA8516260

In a system possessing a negative effective correlation energy, U, the electrical levels are inverted so that the energy required to remove the first electron from the system is greater than that required to remove the second. The lattice vacancy in silicon is unambiguously shown to have this property, with the double donor level (+/+ +) being located above the single donor level (0/+) in the band gap. Electron Paramagnetic Resonance (EPR) was used to directly monitor V+, one of the paramagnetic charge states of the vacancy, while probing the donor levels with low energy optical and thermal excitation. By simultaneously monitoring the EPR signal of the group 3 acceptor, it was possible to identify the charge states involved in the charge transfer processes and to deduce that the vacancy levels were inverted in negative U ordering. The concentration of vacancies being monitored was estimated to be about 70% of that predicted by the simple radiation damage model previously proposed for Si. Dissert. Abstr.

N86-20147 Cincinnati Univ., Ohio.
EFFECTS OF MACROSCOPIC INHOMOGENEITIES ON THE MAGNETORESISTIVITY OF SIMPLE METALS AND CRITICAL FIELD ANISOTROPY IN GRANULAR ALUMINUM Ph.D. Thesis
Kevin Michael Loeffler 1985 211 p
Avail: Univ. Microfilms Order No. DA8518105

The effects of macroscopic voids on the high field thermal magnetoresistivity of the simple metals, including the effects of the lattice conductivity were determined. The calculations were performed using a Green's function approach and a boundary value method. The presence of the lattice conductivity causes large deviations from the linear term evident in the electrical magnetoresistivity. The thermal magnetoresistivity, both transverse and longitudinal, saturates in sufficiently strong fields. The deviation from linearity occurs for 10 is equal to or less than omega sub c tau is equal to or less than 100 depending upon the magnitude of k sub g. The Righi-Leduc coefficient was determined and it was found that the voids caused light increase. The magnetoresistance anomalies of potassium cannot be explained by the presence of voids. Critical field and fluctuation conductivity for extreme type 2 granular aluminum films were measured and found to exhibit a strong temperature dependent anisotropy. Dissert. Abstr.

N86-20148 Ohio State Univ., Columbus.
PICOSECOND DYNAMICS OF CHARGED CARRIERS IN AMORPHOUS SEMICONDUCTORS Ph.D. Thesis
Arvind Inacio DSouza 1985 128 p
Avail: Univ. Microfilms Order No. DA8518930

Picosecond dynamics of charged carriers in a-Si and a-Si:H are investigated. Pulse of width 15 ps, obtained from a cavity dumped dye laser operated at a wavelength of 600 nm and a repetition rate of 400 KHz are utilized to measure changes in reflectance as a function of delay time. Decay curves vary from an exponential decay with positive curvature in a-Si to a curve with negative curvature in a-Si:H. Change in reflectances switches from positive to negative in a-Si:H with the highest hydrogen concentration. A phenomenological model is proposed that divides the density of states of a-Si and a-Si:H into four regions. Change in reflectance is related to the number of electrons in the first and second regions and the number of holes in the third and fourth regions. Photoluminescence plays no role in a-Si and only a minor role in a-Si:H at 300 K. Gap states dominate the recombination mechanism in a-Si and a-Si:H up to 900 ps.
Dissert. Abstr.

N86-20149 Pennsylvania State Univ., University Park.
THE FORMATION AND CHARACTERIZATION OF SIO SUB x-N SUB y Ph.D. Thesis
Richard Kenyon Brow 1985 227 p
Avail: Univ. Microfilms Order No. DA8515999

Silicon oxynitride films were formed by reacting porous, solgel derived silicon dioxide, deposited on single crystal silicon substrates, with ammonia at temperatures between 500 C and 1100 C. Film thicknesses and refractive indices were determined by ellipsometry. Depth profiles of the films by Auger electron spectroscopy and by secondary ion mass spectroscopy showed that nitrogen was uniformly distributed throughout the films. The compositions determined by X-ray photoelectron spectroscopy were found to agree with those calculated from the film refractive indices. The nitrided films were found to resist the high temperature oxidation of the silicon substrates much more effectively than thermal growth silicon dioxide films of comparable thicknesses. Films with greater initial nitrogen contents resisted substrate oxidation for longer times. This behavior was explained using the Deal and Grove model for silicon oxidation. A mechanism for the incorporation of nitrogen, based in part on thermodynamic calculations done using the SOLGASMIX computer program, was developed. Dissert. Abstr.

N86-20150* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GaAs SCHOTTKY BARRIER PHOTO-RESPONSIVE DEVICE AND METHOD OF FABRICATION Patent
George E. Alcorn (Howard Univ., Washington, D.C.), Charles Z. Leinkram (Howard Univ., Washington, D.C.), and Olatunji Okunola, inventors (to NASA) (Howard Univ., Washington, D.C.) Issued 24 Sep. 1985 6 p Filed 24 Jun. 1983 Sponsored by NASA (NASA-Case-GSC-12816-1; US-Patent-4,543,442; US-Patent-Appl-SN-507625; US-Patent-Class-136-255; US-Patent-Class-29-572; US-Patent-Class-136-262; US-Patent-Class-357-15; US-Patent-Class-357-30) Avail: US Patent and Trademark Office CSCL 20L

A gallium arsenide photo-responsive device is provided with an intermediate, transparent layer of a refractory metal or alkaline earth metal forming a tenacious bond between a non-hydroscopic oxide layer and a noble metal Schottky barrier layer. The device has a gallium arsenide substrate with a predetermined type conductivity and a gallium arsenide epitaxial layer with the same type conductivity but a lower charge carrier concentration grown on the substrate. The oxide layer is formed to cover the epitaxial

layer, and the transparent metal layer followed by the noble metal layer are deposited upon the oxide layer. An interdigitated ohmic contact is then formed upon the noble metal layer.
Official Gazette of the U.S. Patent and Trademark Office

N86-20151 Cornell Univ., Ithaca, N.Y.
ON EVALUATING STRAIN FIELDS IN SILICON [001] TWIST GRAIN BOUNDARIES USING ELECTRON DIFFRACTION Ph.D. Thesis
Timothy Dooling Sullivan 1985 234 p
Avail: Univ. Microfilms Order No. DA8516903

Methods have been developed to extract quantitative information on the structure of grain boundaries from electron diffraction patterns recorded on electron-image film in a transmission electron microscope (TEM). The relative intensities of grain boundary reflections (streaks) and matrix reflections are examined, and a criterion for the visibility of grain boundary reflections (streaks) is derived, taking effects of beam divergence into account. It is shown that the intensity of a matrix reflection reciprocal space decreases with the cube of the distance from the origin. Quantitative expressions are derived to link the optical density of exposed electron-image film to reflection intensity. Using quantitative microdensitometry several diffraction patterns from 22 deg twist boundaries are then examined. The results obtained are in agreement with the intensity distribution of the matrix reflection which was derived earlier. Dissert. Abstr.

N86-20152 Cornell Univ., Ithaca, N.Y.
DISLOCATION REACTIONS AT GRAIN BOUNDARIES AND THEIR ROLE IN THE MECHANICAL BEHAVIOR OF CRYSTALLINE INTERFACES Ph.D. Thesis
Leong-Chew Lim 1985 171 p
Avail: Univ. Microfilms Order No. DA8516946

Interactions between crystal slip and grain boundaries were investigated with polycrystals and bicrystals of pure nickel. The specimens were deformed in push-pull low-cycle fatigue at a plastic strain amplitude of 1.35% as well as in uniaxial compression at 573K and strain rates higher than .0003/s. <011> symmetrical tilt bicrystals deformed in uniaxial compression showed that slip traces for screw dislocations were continuous at the grain boundaries and that low sigma boundaries exhibit a high degree of slip continuity than high sigma boundaries. Polycrystals of nickel in low cycle fatigue in vacuum showed that interactions between crystal slip and grain boundaries can lead to cavity formation, boundary migration and dynamic recrystallization, and that high sigma boundaries suffered more severe cavitation and migration as compared with low sigma boundaries. Low cycle fatigue of bicrystals revealed that the edge component of the residual dislocations left in the boundary by reactions of lattice dislocations is important in the various slip induced effects. Dissert. Abstr.

N86-20153*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOTAL-DOSE RADIATION EFFECTS DATA FOR SEMICONDUCTOR DEVICES: 1985 SUPPLEMENT, VOLUME 1
Keith E. Martin, Michael K. Gauthier, James R. Coss, Armando R. V. Dantas, and William E. Price 15 Oct. 1985 132 p
(Contract NAS7-918)
(NASA-CR-176557; JPL-Pub-85-43-Vol-1; NAS 1.26:176557) Avail: NTIS HC A07/MF A01 CSCL 20L

Steady-state, total-dose radiation test data are provided, in graphic format, for use by electronic designers and other personnel using semiconductor devices in a radiation environment. The data were generated by JPL for various NASA space programs. The document is in two volumes: Volume 1 provides data on diodes, bipolar transistors, field effect transistors, and miscellaneous semiconductor types, and Volume 2 provides total-dose radiation test data on integrated circuits. Volume 1 of this 1985 Supplement contains new total-dose radiation test data generated since the August 1, 1981 release date of the original Volume 1. Publication of Volume 2 of the 1985 Supplement will follow that of Volume 1 by approximately three months. Author

N86-20154# Chicago Univ., Ill.
SURFACE DYNAMICS OF RARE GAS CRYSTALS Interim Technical Report
K. D. Gibson and S. J. Sibener Aug. 1985 11 p
(Contract N00014-77-C-0240)
(AD-A159681; AD-E801193; TR-5) Avail: NTIS HC A02/MF A01 CSCL 20/10

The surface properties of rare gas crystals have been explored using a He molecular beam as the dynamical probe. Specifically, ordered monolayer, bilayer, trilayer, and bulk Ar, Kr, and Xe were grown on an Ag(111) substrate. This has allowed us to examine how the physical properties of these films evolve on a layer by layer basis. Elastic diffraction and selective adsorption experiments were used to investigate the He-surface interaction potential. Comparing the results of close-coupled calculations with the experimental data, both the laterally averaged potential and higher order terms in the energy expansion can be determined. To examine the dynamical properties of the adsorbed rare gases, angle and time resolved inelastic scattering was used. This technique made it possible to investigate the dynamics of the surface across the entire Brillouin zone. In this paper on the properties of Ar(111) multilayers are specifically examined. These data are compared to the theoretical calculations of several other groups, testing the validity of several model potentials, and the importance of various interaction terms when constructing these potentials. GRA

N86-20155# California Univ., Santa Barbara. Inst. for Polymers and Organic Solids.
X-RAY SCATTERING FROM POLY(THIOPHENE): CRYSTALLINITY AND CRYSTOLLOGRAPHY STRUCTURE
Z. Mo, K. B. Lee, Y. B. Moon, M. Kobayashi, and A. J. Heeger 1 Oct. 1985 30 p
(Contract N00014-83-K-0450)
(AD-A159895; IPOS-ONR-7) Avail: NTIS HC A03/MF A01 CSCL 20/2

X-ray scattering has been used to investigate the crystallinity and crystal structure of chemically coupled polythiophene. Heat treatment at elevated temperatures leads to significant increases in crystallinity (from approx. 35% as-synthesized up to approx. 56% after annealing at 380 C for 30 minutes) and coherence length indicative of chain growth and extension. Chemical analysis of the chain extended PT shows a major reduction in residual iodine content consistent with growth of the polymer chains to approximately 1200 thiophene rings. An initial model of the crystal structure of polythiophene is presented. Author (GRA)

N86-20156# Northwestern Univ., Evanston, Ill. Dept. of Engineering Science and Applied Mathematics.
FIRST PASSAGE TIMES IN STOCHASTIC DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS AND ENGINEERING Final Report, 1 Apr. 1983 - 30 Mar. 1985
B. J. Matkowsky Apr. 1985 6 p
(Grant AF-AFOSR-0086-83)
(AD-A160323; AFOSR-85-0767TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The goal of our study was to develop new asymptotic and singular perturbation methods for the analysis of random phenomena, and their application in various areas of science and engineering. We have studied the problems of: (1) atomic migration in crystals, (2) ionic and super-ionic conductivity, (3) chemical reaction rates, surface desorption rates, and more general activated rate processes, (4) noise effects on the hysteretic Josephson junction, D.C.-SQUID, and other tunnel junction devices, (5) stability and reliability of randomly loaded elastic structures, and (6) relative stability of various multi-stable systems, among others. Considerable success has been achieved, not only in developing new mathematical methods, but in solving a number of problems whose solution has long been outstanding. These include the Kolmogorov Exit Problem and the Kramers nonlinear diffusion problem, among others. GRA

N86-20157# Naval Academy, Annapolis, Md. Dept. of Physics.
DSC (DIFFERENTIAL SCANNING CALORIMETRY) AND HIGH PRESSURE CONDUCTIVITY AND ELECTRICAL RELAXATION MEASUREMENTS IN PPO POLY(PROPYLENE OXIDE) AND PPO COMPLEXED WITH LITHIUM SALTS Interim Technical Report
J. J. Fontanella and M. C. Wintersgill 1 Sep. 1985 14 p
(AD-A160342; TR-19) Avail: NTIS HC A02/MF A01 CSCL 11/10

Differential scanning calorimetry and high pressure electrical conductivity studies have been carried out on poly(propylene oxide) after the addition of various lithium salts. In addition, high pressure electrical relaxation measurements have been performed in the glass transition region on uncomplexed PPO. The vacuum conductivity measurements show that To is 30 to 40 C lower than the DSC Tg. Next, it is found that both To and Tg increase several K/kbar. In terms of the configurational entropy model, the isobaric data yield a reasonable value for the activation volume which is consistent with values previously reported for PEO complexed with alkali metal ions. The isothermal data yield a negative activation volume for PPO complexed with LiSCN. Finally, DSC and isothermal conductivity measurements show that neither Tg nor the apparent activation volume scale directly with ion size. GRA

N86-20158# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
SOLID STATE RESEARCH Quarterly Technical Report, 1 Nov. 1984 - 31 Jan. 1985
Alan L. McWhorter 15 Feb. 1985 104 p
(Contract F19628-85-C-0002)
(AD-A160922; Rept-1985-1; ESD-TR-84-327) Avail: NTIS HC A06/MF A01 CSCL 20/12

The following aspects of solid state research Solid State Device Research - Heterodyne Radiometry at 28 micrometers; Wideband Integrated-Optics Electrooptic Intensity Modulator for 3.39-micrometers Operation; Quantum Electronics - Transient Carrier Density and Light Output Measurements of Pulsed Diode Lasers; Materials Research Zone-Melting Recrystallization of Si- and Ge-on-Insulator Films, MOSFETs Fabricated Using Self-Aligned Silicide Technology, GaAs Optical MESFET Detectors Fabricated on a Monolithic GaAs/ISi Substrate; microelectronics - A 420 X 420 CCD Imager for Ground-Based Satellite Surveillance, SAW/FET Wideband Programmable Filter, Etched-Emitter Silicon PBT, Linewidth Control with Masked Ion-Beam Lithography Using Stencil Masks, Solid-State Submillimeter Heterodyne Radiometer; Persistent Photoconductivity in Quantum Well Resonators; and Analog Device Technology - In situ Amplitude and Phase Adjustment of SAW Devices by Laser-Photochemical Etching, and Superconductive Chirp-Transform Spectrum Analyzer. GRA

N86-20159# Washington Univ., St. Louis, Mo. Semiconductor Research Lab.
CLUSTERING AND ORDERING IN 3-5 ALLOYS Annual Scientific Report, 1 Jun. 1984 - 31 May 1985
C. M. Wolfe, M. W. Muller, S. J. Hsieh, Elizabeth A. Patten, and P. Roblin 31 Jul. 1985 137 p
(Grant AF-AFOSR-0231-82)
(AD-A161099; WU/SRL-59583A-9; AFOSR-85-0931TR) Avail: NTIS HC A07/MF A01 CSCL 11/6

Staggered lineup heterojunctions are expected to exhibit tunneling assisted optical transitions across the interfacial energy gap E sub I. In the staggered lineup, E sub I is smaller than either of the energy gaps of the constituent semiconductors. In this work, we examined two staggered lineup heterojunctions, ZnSnP2/GaAs and In1-xGaP/GaAs. Below bandgap emission and absorption were observed in these structures, allowing the experimental determination of E sub I. Good agreement was seen between this value of E sub i and that from the predicted band lineup. Advances in technology have made possible the fabrication of rapidly varying heterostructures which hold the promise of important applications. We develop a set of approximate treatments of electron states in a variety of layered heterostructures. Recent III-V alloy formation models indicate that negative charge transfer energy can overcome positive bond distortion energy to stabilize long-range order or compound formation. Although a report of a layered ordering in A1xGa1-xAs tends to confirm this result, we have as yet obtained no convincing evidence for such ordering in InxGa1-xP. GRA

N86-20160# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
MOLECULAR BEAM EPITAXIAL (MBE) GROWTH OF GALLIUM ARSENIDE AND GALLIUM ALUMINUM ARSENIDE
Helmut Kanter 30 Sep. 1985 27 p
(Contract F04701-83-C-0084)
(AD-A161147; TR-0084A(5925-01)-4; SD-TR-85-69) Avail: NTIS HC A03/MF A01 CSCL 20/2

The construction and operation of a molecular beam epitaxial (MBE) system for promoting the epitaxial growth of gallium arsenide (GaAs) and gallium aluminum arsenide (GaAlAs) materials is described. These materials are studied in support of development of GaAs-based microwave and millimeter-wave devices as well as fast integrated digital circuits. GRA

N86-20161# Lawrence Livermore National Lab., Calif.
SIMULATION OF LIQUID HELIUM
D. M. Ceperley Jul. 1985 26 p refs Presented at the International School of Physics on Molecular Dynamics Simulation of Statistical Mechanical Systems, Varenna, Italy, 23 Jul. 1985
(Contract W-7405-eng-48)
(DE85-015397; UCRL-92970; CONF-850764-2) Avail: NTIS HC A03/MF A01

The author discusses simulation methods for quantum mechanical systems at finite temperatures. Recently it has been shown that static properties of some quantum systems can be obtained by simulation in a straightforward manner using path integrals, albeit with an order of manitude more computing effort needed than for the corresponding classical systems. Some dynamical information can be gleaned from these simulations as will be discussed below. But this is very limited - there is no quantum version of the molecular dynamics method. The path integral method is illustrated by scussing the application to liquid helium. DOE

N86-20162# Salerno Univ. (Italy).
PAIR TUNNELING IN A TWO-DIMENSIONAL SUPERCONDUCTOR
R. Vaglio, A. Cucolo, and C. M. Falco [1985] 12 p
(Contract DE-AC02-83ER-45025)
(DE85-014445; DOE/ER-45025/8) Avail: NTIS HC A02/MF A01

Pair tunneling to a two-dimensional superconductor is reported for the first time. It is found that flux quantization disappears due to the nature of the two-dimensional superconductor, while the magnitude of the pair tunneling current is unaffected. Also due to the specific behavior of the system under consideration, a crossover to conventional three-dimensional behavior is observed at low temperatures. DOE

N86-20163# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
RESONANT, INELASTIC SINGLE PHONON PROCESSES IN THE SCATTERING OF He ATOMS ON LiF(001) SURFACES Thesis [RESONANTE, INELASTICHE EIZELPHONONPROZESSE BEI DER STREUUNG VON He-ATOMEN AN DER LiF(001)-OBERFLAECHE]
D. Eichenauer May 1985 160 p refs In GERMAN
(MPIS-9/1985; ISSN-0436-1199) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

Inelastic scattering processes in the thermal energy domain were studied in the He-LiF(001) model system in order to determine the role of solid state surfaces as catalysts. The inelastic scattering of low energy (20 meV) He-atoms on a pure LiF(001) single crystal surface and the concomitant resonance effects were theoretically treated. Realistic models were taken as starting points in order to enable a comparison with experimental data. Since the resonances occur under well defined, easily specifiable kinematic

conditions, the measured energy loss spectra and angular distributions, compared with the dynamic calculation, allow qualitative as well as quantitative statements concerning microscopic, exactly determined elementary steps in adsorption and desorption processes. Author (ESA)

N86-19727*# Shin-Etsu handotai Co., Gumma (Japan).
POTENTIAL PRODUCTIVITY BENEFITS OF FLOAT-ZONE VERSUS CZOCHRALSKI CRYSTAL GROWTH
Takao Abe *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 55-80 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19728*# Massachusetts Inst. of Tech., Cambridge.
NEW OUTLOOK ON CONTROL OF CRYSTALLINE AND CHEMICAL PERFECTION DURING GROWTH OF SILICON
A. F. Witt *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 83-96 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19729*# International Business Machines Corp., Hopewell Junction, N. Y.
MCZ: STRIATIONS IN CZ SILICON CRYSTALS GROWN UNDER VARIOUS AXIAL MAGNETIC FIELD STRENGTHS
George K. M. Kim *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 97-107 refs (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19730*# Hughes Research Labs., Malibu, Calif.
HIGH PURITH LOW DEFECT FZ SILICON
H. Kimura and G. Robertson *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 109-121 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19731*# RCA Labs., Princeton, N. J.
DEFECTS IN SILICON EFFECT ON DEVICE PERFORMANCE AND RELATIONSHIP TO CRYSTAL GROWTH CONDITIONS
L. Jastrzebski *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 123-143 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19732*# Washington Univ., St. Louis, Mo.
SIMULATION OF THE TEMPERATURE DISTRIBUTION IN CRYSTALS GROWN BY CZOCHRALSKI METHOD
M. P. Dudokovic and P. A. Ramachandran *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 147-173 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19733*# Arizona State Univ., Tempe.
CONVECTIVE EFFECTS IN FLOAT-ZONE AND CZOCHRALSKI MELTS
G. P. Neitzel *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1986 p 175-192 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19734*# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
THERMAL-CAPILLARY MODEL FOR CZOCHRALSKI GROWTH OF SEMICONDUCTOR MATERIALS
J. J. Derby and R. A. Brown *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 195-214 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19736*# State Univ. of New York, Albany.
OXYGEN AND CARBON IN SILICON
J. W. Corbett *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 235-257 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19737*# Texas Instruments, Inc., Sherman.
SOLAR CELL AND I.C. ASPECTS OF INGOT-TO-SLICE MECHANICAL PROCESSING
Lawrence D. Dyer *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 259-277 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-19738*# Storti (George), Washington, D.C.
DEFECTS AND DEVICE PERFORMANCE
George Storti, R. Armstrong, S. Johnson, H. C. Lin, W. Regnault, and K. C. Yoo *In* JPL Proceedings of the Flat-Plate Solar Array Project Workshop 15 Aug. 1985 p 279-291 (For primary document see N86-19723 10-44)
Avail: NTIS HC A13/MF A01 CSCL 10B

N86-20059# Joint Publications Research Service, Arlington, Va.
PHOTOELECTRIC DOMAIN STRUCTURE IN RUBY CRYSTALS Abstract Only
S. A. Basun, A. A. Kaplyanskiy, and S. P. Feofilov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 3-4 Transl. into ENGLISH from Zhurnal Eksperimentalnoy I Teoreticheskoy Fiziki (Moscow, USSR), v. 87, no. 12, Dec. 1984 p 2047-2061 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

N86-20060# Joint Publications Research Service, Arlington, Va.
PHOTOELECTRIC DOMAIN STRUCTURE: THEORY Abstract Only
M. I. Dyakonov and A. S. Furman *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 4 Transl. into ENGLISH from Zhurnal Eksperimentalnoy I Teoreticheskoy Fiziki (Moscow, USSR), v. 87, no. 12, Dec. 1984 p 2063-2074 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N86-20164 Nebraska Univ., Lincoln.
THE GRAVITATIONAL FIELD DUE TO MASSLESS SCALAR FIELDS Ph.D. Thesis
James Carl Conwell 1985 128 p
Avail: Univ. Microfilms Order No. DA8516867

New metric solutions of Einstein's field equations are found for the stress-energy tensor due to massless scalar fields having plane and cylindrical symmetry. The Riemann curvature tensor is computed and the tidal forces due to these new solutions are studied. The location of singularities in the manifold is also discussed for these new solutions. Dissert. Abstr.

N86-20080# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF THERMAL FIELD OCCURRING DURING LASER HEATING OF METALS Abstract Only
N. A. Kirichenko and Yu. Yu. Morozov *In its* USSR Report: Physics and Mathematics (JPRS-UPM-86-005) 11 Feb. 1986 p 76 Transl. into ENGLISH from Kvantovaya Elektronika (Moscow, USSR), v. 11, no. 11, Nov. 1984 p 2331-2335 (For primary document see N86-20057 10-70)
Avail: NTIS HC A06/MF A01

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N86-20165# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
RESEARCH AND DEVELOPMENT PROJECT SELECTION METHODS AT THE AIR FORCE WRIGHT AERONAUTICAL LABORATORIES M.S. Thesis
Jeremy R. Prince Sep. 1985 77 p
(AD-A161153; AFIT/GSM/LSY/85S-29) Avail: NTIS HC A05/MF A01 CSCL 14/2

This thesis sought to determine how in-house research projects are selected at the U.S. Air Force Wright Aeronautical Laboratories (AFWAL). The problem was explored by studying ten aspects of the research project selection process. This analysis was accomplished by using a combination of personal and telephone interviews. Ten individuals from each of the four AFWAL Laboratories were interviewed. The results illustrated that few of the respondents used a formal decision method model when selecting research projects. Most of the in-house projects selected at AFWAL are chosen via a consensus of agreement between the various levels of management in each laboratory. GRA

N86-20271# Joint Publications Research Service, Arlington, Va.
NEW SPACE ADMINISTRATION GLAVKOSMOS USSR CREATED
In its USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 164-165 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 13 Oct. 1985 p 3 (For primary document see N86-20178 10-88) Avail: NTIS HC A03

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N86-20166 Drexel Univ., Philadelphia, Pa.
A COMPARISON OF DOCUMENT CLUSTERS DERIVED FROM CO-CITED REFERENCES AND CO-ASSIGNED INDEX TERMS Ph.D. Thesis
Barbara Ann Rapp 1985 229 p
Avail: Univ. Microfilms Order No. DA8513956

The database partitioning effects of co-cited references and co-assigned MeSH term indexing systems, both of which have the common information retrieval purpose of identifying documents related in subject were examined. A matched dataset of over 8500 documents, published during the years 1975 to 1977 in 20 cardiology journals were drawn from the MEDLINE database and from the Institute for Scientific Information's citation database. Single link clustering was used to partition the data set in three different ways. Co-citation clustering was used to partition on the basis of reference relationships. To partition on the basis of MeSH index terms, both term clustering and document clustering were used. Results of the three cluster analyses were compared pairwise to measure similarity of document placement. Overlap between cluster systems was measured. Extremely low overlap between the clusters derived from co-citation analysis and those derived from term clustering or document clustering based on MeSH term relationships was found. Dissert. Abstr.

N86-20167 Lehigh Univ., Bethlehem, Pa.
A GEOMETRICAL MODEL FOR DBMS: AN EXPERIMENTAL DBMS USING IBM SOLID MODELLING Ph.D. Thesis
Ali Dia El-Din Loutfy 1985 126 p
Avail: Univ. Microfilms Order No. DA8516245

Geometrical data base management system (DBMS) solid modeling technology in designing and implementing DBMS. The Geometrical DBMS is implemented using IBM solid modelling Geometric Design Processor (GDP). In Geometrical DBMS, the graphical aspect of the model is not an alien concept tailored to the model but is, as a matter of fact, the atom around which the model was designed. The main idea in Geometrical DBMS is to allow the user and the system to refer to and manipulate data items as objects and attributes. This is done by representing a data item as a solid object in 3D space, and representing a record as a group of logically related solid objects. In Geometrical DBMS, the hierarchical structure is used to present the data relations, the user sees the data as a group of arrays yet, for the user and the system together, the data structure is a multidimensional tree. Dissert. Abstr.

N86-20168* National Aeronautics and Space Administration, Washington, D.C.
NASA THESAURUS. VOLUME 1: HIERARCHICAL LISTING 1985 Edition
Sep. 1985 851 p
(NASA-SP-7053-Vol-1; NAS 1.21:7053-Vol-1) Avail: NTIS HC $35.00

There are 16,835 postable terms and 3,765 nonpostable terms approved for use in the NASA scientific and technical information system in the Hierarchical Listing of the NASA Thesaurus. The generic structure is presented for many terms. The broader term and narrower term relationships are shown in an indented fashion that illustrates the generic structure better than the more widely used BT and NT listings. Related terms are generously applied, thus enhancing the usefulness of the Hierarchical Listing. Greater access to the Hierarchical Listing may be achieved with the collateral use of Volume 2 - Access Vocabulary. Author

N86-20169* National Aeronautics and Space Administration, Washington, D.C.
NASA THESAURUS. VOLUME 2: ACCESS VOCABULARY 1985 Edition
Sep. 1985 402 p
(NASA-SP-7053-Vol-2; NAS 1.21:7053-Vol-2) Avail: NTIS HC $20.00

The Access Vocabulary, which is essentially a permuted index, provides access to any word or number in authorized postable and nonpostable terms. Additional entries include postable and nonpostable terms, other word entries, and pseudo-multiword terms that are permutations of words that contain words within words. The Access Vocabulary contains 40,738 entries that give increased access to the hierarchies in Volume 1 - Hierarchical Listing. Author

N86-20170* National Aeronautics and Space Administration, Washington, D.C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 28)
7 Mar. 1986 55 p
(NASA-SP-7039(28); NAS 1.21:7039(28)) Avail: NTIS HC A04 CSCL 05B

Abstracts are provided for 109 patents and patent applications entered into the NASA Scientific and Technical Information System during the period July 1985 through December 1985. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

N86-20171# Litton Mellonics Systems Development Div., Fort Benning, Ga.
AN ANNOTATED BIBLIOGRAPHY OF THE MANNED SYSTEMS MEASUREMENT LITERATURE Final Report
J. M. Edwards, R. F. Bloom, J. F. Oates, Jr., S. Sipitkowski, and P. A. Brainin Feb. 1985 505 p Prepared in cooperation with Dunlap and Associates, Inc., Darien, Conn.
(Contract MDA903-80-C-0345; DA Proj. 2Q2-63743-A-794)
(AD-A160333; Rept-293-6; ARI-RN-85-18) Avail: NTIS HC A22/MF A01 CSCL 05/8

A comprehensive computerized literature search was conducted on the subject of systems and measurement theory and practice. As a result of this search, 244 citations were identified as very likely relevant to the area of interest, and were abstracted for this document. GRA

N86-20172# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A LONGITUDINAL STUDY OF THE RELATIONSHIP BETWEEN USER ATTITUDES AND THE SUCCESS OF THE MAJCOM AND AFRCE WORK INFORMATION MANAGEMENT SYSTEM M.S. Thesis
Paul E. McMullin Sep. 1985 165 p
(AD-A161055; AFIT/GEM/LSM/85S-10) Avail: NTIS HC A08/MF A01 CSCL 05/1

This thesis determines whether or not the relationship between Work Information Management System (WIMS) user attitudes and success found in previous military research has changed over time, and determines if WIMS is perceived to be more successful in 1985 than it was in 1984. Finally, this research evaluates how WIMS has impacted Major Command and Air Force Regional Civil Engineer organizations based on the responses of the users. 400 surveys were distributed to 19 MAJCOM and AFRCEs. Statistical techniques were used to answer the five research questions. A response rate of 55.5 percent was achieved. Results indicate that the relationship between user attitudes and the perceived success of WIMS has not changed significantly, and that WIMS is perceived to be more successful in 1985 than it was in 1984. Statistical Analysis techniques used included factor analysis, multiple regression, and a two-sample T test. GRA

N86-20173# MacAulay-Brown, Inc., Fairborn, Ohio.
AUTOMATED INFORMATION MANAGEMENT TECHNOLOGY (AIM-TECH): CONSIDERATIONS FOR A TECHNOLOGY INVESTMENT STRATEGY Final Report
Walter Reitman, Ralph M. Weischedel, Kenneth R. Boff, Mark E. Jones, and Joseph P. Martino May 1985 216 p
(Contract F33615-82-C-0513)
(AD-A161139; AFAMRL-TR-85-042) Avail: NTIS HC A10/MF A01 CSCL 09/2

The Automated Information Management Technology Program (AIM-Tech) has focused on evaluating the key factors to an investment strategy for implementing artificial intelligence technology in three technical domains: systems design; pilot/aircrew automation; and command, control, and communications (C3). A state-of-the-art review of artificial intelligence (AI), functional specifications for future AI aided systems, and required AI capabilities are discussed. The state-of-art review assesses eight technology areas: expert systems and knowledge engineering, natural language, knowledge representation, computer vision, tutoring and training, planning and problem solving under real world conditions, AI tools and environments, and speech. Functional specifications are classified into three groups for each technical domain: communications, expert understanding, and decision aiding. Futuristic scenarios were constructed in which information and control management choke points are resolved by the hypothetical application of machine intelligence for each of the three domains. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N86-20174# Committee on Science and Technology (U. S. House).
AUTHORIZING APPROPRIATIONS FOR LANDSAT COMMERCIALIZATION
Washington GPO 1985 6 p Rept. to accompany H.S. 2800 presented by the Committee on Science and Technology to the 99th Congr., 1st Sess., Jun. 1985
(H-Rept-99-177; GPO-61-006) Avail: US Capitol, House Document Room

Appropriations for 1985 through 1989 for transfer to the private sector of the LANDSAT system by the Federal Government are described. B.G.

N86-20175# Comptroller General of the United States, Washington, D.C.
FEDERAL AGENCIES' POLICIES AND PRACTICES ARE IN ACCORDANCE WITH PATENT AND TRADEMARK AMENDMENTS OF 1980
[1985] 45 p
(B-207939; Rept-3) Avail: NTIS HC A03/MF A01

Implementation of Patent and Trademark Amendments of 1980 by 10 federal agencies was examined. Federal research and development procurement policies, regulations, and practices were reviewed for each agency. The 1984 funding agreements with contractors and grantees and the research and development titling and licensing activities of the agencies since the passage of the law were reviewed. The role of the Dept. of Commerce in implementing the Act was determined. How small businesses and nonprofit organizations viewed the changes in research and development activities was discussed. B.G.

N86-20176# Committee of Conference (U. S. Congress).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1986
Washington GPO 19 Nov. 1985 18 p Rept. to accompany H.R. 1714 presented by the Committee of Conference to the 99th Congression, 1st Session, Nov. 1985
(H-Rept-99-379; GPO-54-684) Avail: US Capitol, House Document Room

Appropriations to NASA for research and development, space flight, control and data communications, construction of facilities, and research and program management are discussed. Shuttle pricing policies for commercial and foreign users are also described. B.G.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N86-20177# Committee on Science and Technology (U. S. House).
TECHNOLOGY TRANSFER

Washington GPO 1985 259 p Hearings before the Subcommittee on Science, Research and Technology, 99th Congr., 1st Sess., no. 22, 21-22 May 1985
(GPO-49-539) Avail: Subcommittee on Science, Research and Technology

Budget restraints; assessment; of changes in technology transfer since 1980; redefining of Federal role in technology transfer; cooperative agreements; invention policy; transfer of technology from Federal laboratories; and flow of American Commercial products developed from government research were discussed. B.G.

88 SPACE SCIENCES (GENERAL)

N86-20178# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
13 Jan. 1986 186 p Transl. into ENGLISH from various Russian articles
(JPRS-USP-86-001) Avail: NTIS HC A09

Numerous aspects of the U.S.S.R. space program are discussed. Manned space flight, geometrical optics, airglow, planets, photointerpretation, space maintenance, comets, gamma ray bursts, soil analysis, and radar maps are among the topics covered. For individual titles, see N86-20179 through N86-20272.

N86-20179# Joint Publications Research Service, Arlington, Va.
FEOKISTOV REVEALS DETAILS OF SALYUT-7 REACTIVATION c18
K. Feokistov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 1-6 Transl. into ENGLISH from Pravda (Moscow, USSR), 5 Aug. 1985 p 3; 8 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

In a routine check a problem in one of the units of the Salyut-7 radio system, through which commands from the Earth pass, was discovered. As a result, radio contact from the station ceased and it became impossible to obtain telemetry information on the condition of the station's on-board navigation systems. It became clear that in order to restore normal operation it would be necessary to have a crew on board. But to do this a scheme had to be worked out for guiding a transport ship to the silent station at an undetermined point in the expanse of space, to prepare a ship and crew for the flight and for performing this unusual task, to outfit this ship with the new equipment needed for such an operation, to work out a new ballistic path for the approach and to train the specialists of the Flight Control Center. The technology developed in order to approach the station is discussed. On 6 June the spacecraft Soyuz T-13, manned by V. Dzhanibekov and V. Savinykh, was put into orbit. After corrections to its orbit were completed, on the morning of 8 June the spacecraft approached the station. When the ship and station exited from shadow they were at a distance of about ten kilometers from each other. V. Dzhanibekov aligned the ship's lateral axis with that of the station, observing it through the porthole of the ship's descent craft while V. Savinykh entered data into the computer according to Dzhanibekov's commands. At a distance of two and one half kilometers the automatic equipment executed the last correction maneuver and the crew took manual control. The calculations of the on-board computers were accurate enough that the corrections to the approach trajectory that had to be made manually were insignificant. R.J.F.

N86-20180# Joint Publications Research Service, Arlington, Va.
PREPARATION OF COSMONAUTS FOR SALYUT-7 REACTIVATION MISSION c18
Yu. Glazkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 10-13 Transl. into ENGLISH from Pravda (Moscow, USSR), Sep. 1985 p 3 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The preparations of the cosmonauts who flew to the crippled Salyut-7 Space Station in order to reactivate it are discussed. The development of a laser range finder and a night vision instrument that were used on the mission is discussed. R.J.F.

N86-20181# Joint Publications Research Service, Arlington, Va.
SOYUZ T-13 LANDS WITH COSMONAUTS DZHANIBEKOV AND GRECHKO c18
In its USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 50 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 27 Sep. 1985 p 1 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

On 26 September 1985, at 1352 hours Moscow time, Vladimire Dzhanibekov and Georgiy Grechko returned to Earth in the Soyuz T-13 spaceship after completing the planned program of joint research and experiments. Vladimir Vasyutin, Viktor Savinykh and Aleksandr Volkov are continuing to work on board the manned complex Salyut-7 – Soyuz T-14. Delivered to Earth were research materials and experiments performed by Vladimire Dzhanibekov and Viktor Savinykh and also by the crew of five cosmonauts. The fourth long-term expedition on Salyut-7 began 8 June 1985, following the successful docking of the Soyuz T-13 ship with the station. In the course of their flight, Vladimir Dzhanibekov and Viktor Savinykh restored the station to working order, demonstrating courage and high professional skill in doing this. The cosmonauts carried out an extensive program of scientific-technical research, and made an egrees into open space to install extra solar panels. For the first time, a crew has been partially replaced, which ensures the continuous operation of the manned space complex over an extended time, and substantially heightens the effectiveness of its use in the interests of science and the economy. R.J.F.

N86-20182# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON 237 DAY EXPEDITION TO SALYUT-7 c18
S. A. Bovin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 54-62 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 9-15 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The 237 day flight of Soviet cosmonauts aboard the Salyut-7 station, the longest in the history of the space age, has been completed (Zemlya i Vselennaya, 1983, No 1, p. 2; 1984, No. 1, p. 6; No 3, p. 2; No 6, p. 2 - Ed.). The crew in flight performed a large volume of medical, biological, technological, astrophysical, geophysical as well as preventive maintenance work. The flight to the Salyut-7 station began on 8 February 1984 aboard the Soyuz T-10 transporter. The goal of the flight was to discover how successfully a group of three persons could tackle scientific-technical problems in lengthy orbital flight. For successful management of this experiment and the corresponding medical examinations directly on board the station, cardiologist O. Yu. At'kov was included in the crew. Besides the standard medical apparatus, a special apparatus was also delivered to the station for better observation of the condition of the cosmonauts during the lengthy flight. The presence of a doctor on board the station provided an objective assessment of the state of the crew and, if necessary, the length flight could be curtailed. At'kov conducted two very important experiments involving fundamental aspects of biology. In the Membrana experiment on red blood cells and artificially-created analogs of biological membranes, interesting results were obtained revealing the features of the functions and vital cell components responsible for communication with the environment. In the experiment Genom, an attept was made to employ the advantages conferred by weightlessness to separate large fragments of the DNA molecule, enabling a faster deciphering of the human genetic code. R.J.F.

N86-20183# Joint Publications Research Service, Arlington, Va.
INTERVIEW WITH COSMONAUTS KIZIM AND SOLOVYEV c12
G. I. Vorobyev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 63-70 Transl. into ENGLISH from Zemlya i

Vselennaya (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 16-22 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

An interview with Salyut-7 cosmonauts who completed a 237 day mission space is given. Spaceborne experiments in medicine, oceanography, astrophysics and mineral exploration are discussed. R.J.F.

N86-20184# Joint Publications Research Service, Arlington, Va.
BLAGOV ON DEVELOPMENT OF COSMONAUT EVA PROGRAMS c12
V. D. Blagov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 71-79 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 2-8 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The recollections of V.D. Blagov, the second-in-command during the first space walk in outer space, are given. Some details of space maintenance procedures and tools are given. R.J.F.

N86-20185# Joint Publications Research Service, Arlington, Va.
COMMENTS ON SOVIET-FRENCH PROJECT FOR GAMMA-1 ORBITAL TELESCOPE c12
G. Alimov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 80-82 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 10 Mar. 1985 p 2 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A general account is given of the Gamma 1 orbital telescope mission. The capabilities of the telescope, gamma radiation, and stars are discussed. R.J.F.

N86-20186# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF INVESTIGATING STAR SYSTEMS BY RADAR Abstract Only c32
O. N. Rzhiga *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 83 Transl. into ENGLISH from Astronomicheskiy Zhurnal (Moscow, USSR), v. 62, no. 3, May - Jun. 1985 p 500-505 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

There is no fundamental reason why radar cannot be used in investigations of star systems. In order to detect star systems by radar it is necessary to construct an antenna with a diameter of several tens of kilometers and a transmitter whose power is commensurable with the power of all electric power stations on the Earth. Such an antenna should be in outer space in order to avoid the influence of radio ray refraction in the Earth's troposphere and to to give rise to radio noise. At present the construction of such a radar apparatus may seem incredible, but there are no fundamentally insoluble problems. The closest stars are 10,000 times more distant from the Sun than Pluto. In order to make successful radar observations of star systems there would have to be the same jump in energy potential as with the transition from radar observations of the Moon to radar observations of Pluto. If the rates of increase in energy potential persist, radar observations of star systems will become realistic by the middle of the 21st century. A system for interstellar communication having a receiving antenna with an effective area of 2 x 10 to the 9th power square meters operating at a wavelength of 3 cm with a receiver noise temperature of 10 K can ensure transmission of a television signal from a distance of 4.34 light years with use at the transmitting end of an antenna with a diameter of 10 m and a transmitter with a power of 1 million W. Radar observations of star systems will open the way to interstellar ships in the same way that radar observations of planets in the solar system opened the way for the interplanetary stations. Author

N86-20187# Joint Publications Research Service, Arlington, Va.
USE OF LIQUID MIRRORS IN ASTRONOMY Abstract Only c89
V. P. Vasilyev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 84 Transl. into ENGLISH from Astronomicheskiy Zhurnal (Moscow, USSR), v. 62, no. 3, May - Jun. 1985 p 598-601 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The development of a liquid telescope with a mirror placed in a rotating system of intermediate damping fluids is discussed. Experimental data indicating the advantages of use of this method in astronomy are given. The examination of this problem indicates that the use of liquid mirrors is far more promising than is usually assumed and the designing and construction of large zenith telescopes with a liquid objective is feasible. As a highly reflecting liquid it is possible to use mercury with a protective layer of glycerin or a gallium melt. In addition to having a high-quality surface, a liquid mirror is incomparably cheaper and more easily produced than a traditional mirror, is not subject to thermal and static deformations and has a controllable surface configuration. A system of such telescopes at different latitudes can be irreplaceable for problems of the scanning-search type. The use of a liquid mirror in a vertical solar telescope would not even require changes in its basic optical system. The simplicity of this method makes its use possible in the construction of ultralarge objectives for future generations of telescopes operating in both optical and microwave ranges. There is no need for mechanical processing of the mirror surface and efforts necessary for producing adequate materials and means for their hardening during the rotation process are justified. Author

N86-20188# Joint Publications Research Service, Arlington, Va.
PROCEDURE FOR INTEGRATING EQUATIONS FOR ELEMENTS OF INTERMEDIATE SATELLITE ORBIT Abstract Only c13
N. V. Yemelyanov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 84-85 Transl. into ENGLISH from Astronomicheskiy Zhurnal (Moscow, USSR), v. 62, no. 3, May - Jun. 1985 p 590-597 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

One of the most perfect models of intermediate motion of a satellite is the orbit of the generalized problem of two fixed centers which takes into account the second and third zonal harmonics in the expansion of planetary gravitational potential. However, until now the equations for the elements of such an intermediate orbit have been solved only in the first approximation and there has been no clearly defined scheme for their integration in subsequent approximations. Since for an intermediate orbit, taking the Earth's oblateness into account, the perturbing actor is 1,000 times less than for a Keplerian orbit, the solution is simpler. The coefficients of the equations for such an intermediate orbit and the perturbing function are represented in the form of expansions in powers of the Earth's oblateness and it is an unwieldy problem to write these expansions. Operations which must be performed are clarified. Expansion terms that must be taken into account in order to obtain perturbations of the elements of an intermediate orbit with accuracy are discussed. The problem is solved on the assumption that secular and short-period perturbations must be determined with an accuracy to the third power of the Earth's oblateness and long-period perturbations with an accuracy to the second power of oblateness. Author

N86-20189# Joint Publications Research Service, Arlington, Va.
OPTICAL RADIATION AND RADIO EMISSION ACCOMPANYING COSMIC GAMMA BURSTS Abstract Only c93
N. N. Vzorov, L. P. Gorbachev, A. Yu. Matronchik, and K. S. Mozgov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 85-86 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 6, Jun. 1985 p 444-447 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

In order to register cosmic gamma radiation with an energy $>$ 10 GeV and fluxes 0.0000000001 quantum/square centimeters times s it is necessary to have greater areas of detectors than those now present on spacecraft. C. Castagnoli, et al., proposed that gamma quanta with energies 0.00001 GeV be registered on the basis of records of Cerenkov flares from relativistic electrons of extensive atmospheric showers caused in the Earth's upper atmosphere by primary gamma quanta using large solar antenna arrays at nighttime. With that proposal taken into account, the

authors have evaluated the intensity of the light flashes excited in the atmosphere by gamma bursts. Calculations are given showing that the maximum intensity of atmospheric glow in the band lambda = 3914 A will be I sub max = 0.000001 minus 0.001 erg/square centimeters times s. In the case of the powerful gamma burst of 5 March 1979 I sub max equals 2 times 0.000001 erg/square centimeters. It is concluded that light flashes of this intensity can be registered using the large solar antenna arrays which it is proposed to be used for measuring the Cerenkov radiation (with an intensity 0.0000001 erg/square centimeters times s) from high-energy gamma quanta. The intensity of the light gamma flashes excited in the atmosphere by gamma bursts (0.01 minus 10 MeV) in order of magnitude coincides with the intensity of the Cerenkov radiation excited by electron showers from gamma quanta (10 minus 0.001 GeV) so that these flares must be taken into account in the registry of high-energy gamma quanta. Since there is a common nature of the mechanism for generation of optical and radio signals, they can be used together in the registry of cosmic gamma bursts. Author

N86-20190# Joint Publications Research Service, Arlington, Va.
COMETARY ICE HALO AND TEMPERATURE OF INNER COMA Abstract Only **c90**
D. V. Bisikalo and V. S. Strelnitskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 86 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 6, Jun. 1985 p 475-480 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A study was made of the influence of an ice halo on the temperature of the inner coma of a comet for a comet of average brightness situated at a heliocentric distance 1 a.u. It is shown that the presence of a halo can greatly smooth the temperature minimum, increasing the minimum temperature by several times. A hydrodynamic model of the inner coma was computed with the following assumptions: There is a stationary spherically symmetric flow of gas and ice particles; the cometary nucleus, gas and ice particles consist only of H2O; the ice particles are accelerated by the gas, but the gas does not experience significant slowing in the process; at the nucleus surface the gas velocity is equal to the speed of sound so that the entire gas flow is supersonic; the gas is heated due to photodissociation of molecules by an unattenuated flux of solar radiation and as a result of the entry into it of thermal molecules evaporating from the surface of ice particles; the gas is cooled only due to expansion; the surface temperature of the nucleus and ice particles is determined by the balance between the processes of absorption of solar radiation, evaporation and thermal radiation and is stipulated as a constant parameter; the ice particles are spheres of an identical radius with an identical evaporation rate over the entire surface. It is demonstrated that cooling in the inner coma can be considered negligible at distances up to approximately 1,000 km from the nucleus. R.J.F.

N86-20191# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SURFACE STRUCTURE OF CELESTIAL BODIES WITHOUT ATMOSPHERES ON POLARIZATION CHARACTERISTICS OF REFLECTED LIGHT Abstract Only **c89**
L. O. Kolokolova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 86 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 2, Apr. - Jun. 1985 p 165-173 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Observations of celestial bodies without atmospheres and laboratory experiments with terrestrial samples indicate that the plane polarization of the light scattered by them is sensitive to the composition and structure of the surface. The dependence of the degree of polarization P of scattered light on phase angle alpha is the most informative. With this taken into account, the author applied the geometrical optics approach in examining the scattering of light on spherical body covered by randomly scattered fissures. Single and double reflection and shadow effects are taken into account. It was found that the curve of the dependence of the degree of polarization on phase angle has a negative branch only when the angle between the surfaces is close to 90 deg. Surface structure was found to be the principal factor responsible for the depth and shape of the negative branch of polarization. Asteroids of different types differ substantially with respect to surface structure despite a quite similar nature of surface layer matter: the value of the complex refractive index of this matter is considerably greater than the corresponding value for surface layer matter of the Galilean satellites of Jupiter. Accordingly, any quantitative theory of light reflection by bodies without atmospheres must include parameters determining surface structure. R.J.F.

N86-20192# Joint Publications Research Service, Arlington, Va.
SIMULTANEOUS OBSERVATIONS OF LONGITUDINAL CURRENTS, STREAMS OF CHARGED PARTICLES AND IONOSPHERIC GLOW DURING POLAR SUBSTORM OF 30 DECEMBER 1981 BY ARTIFICIAL EARTH SATELLITE INTERCOSMOS-BOLGARIYA-1300 Abstract Only **c43**
L. N. Zhuzgov, Z. N. Zaytsev, A. K. Kuzmin, V. I. Lazarev, V. O. Papitashvili, V. G. Petrov, M. V. Teltsov, L. O. Tyurmina, V. A. Sharova, and S. I. Shkolnikova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 88 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow, USSR), v. 25, no. 2, Mar. - Apr. 1985 p 328-331 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A simultaneous study was made of longitudinal currents, streams of charged particles penetrating into the ionosphere and ionospheric glow at the time of the polar substorm of 30 December 1981 on the basis of the results of observations by the artificial Earth satellite Intercosmos-Bolgariya-1300 and their comparison with magnetic data from ground observatories situated in the auroral oval near the projection of the satellite orbit. The data were used in formulating a model of substorm development. It was found that there is a good consistency between the observed phenomena and existing models of development of a polar substorm. During the course of this substorm the auroral oval expanded in the evening sector MLT to approx 20 deg along the meridian and was displaced toward the equator to Phi' approx 55 degrees and the large-scale system of longitudinal currents became stratified, probably due to reciprocal penetration of the easterly and westerly electrojets. The electrical currents flowing from the ionosphere were caused by electrons with E = 1 to 3 keV leaking into the ionosphere. The observed inflowing electrical currents coincide with a decrease in the flux of electrons with E = 1 keV and cannot be generated by fluxes of leaking ions with E = 0.4 to 15 keV. In the region of auroral curvature, moving westward, satellite instruments registered discrete auroral arcs, an intensive longitudinal current with a density 0.00001 A/square meters, directed from the ionosphere, and intensive streams of leaking electrons with characteristic humped spectra and a maximum in the energy range 1 to 3 keV. Author

N86-20193# Joint Publications Research Service, Arlington, Va.
COMPARISON OF THREE SATELLITE MODELS OF MAIN GEOMAGNETIC FIELD Abstract Only **c43**
N. P. Benkova and G. I. Kolomiytseva *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 89 Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow, USSR), v. 25, no. 2, Mar. - Apr. 1985 p 343-345 Original language was announced in IAA as A85-32840 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The Cosmos-49 model is compared with the OGO and MAGSAT 6/80 models. The results indicate that, in order to obtain sufficiently reliable spherical harmonic coefficients, it is necessary that the data cover the entire (or almost the entire) globe. The fact that observations were made at different heights (Cosmos and MAGSAT at 300 to 500 km, OGO at 400 to 1500 km) did not have a significant influence on the three models. Thus, if the task of the model is an approximation of the main field along, it is fully admissible to use data from high-flying satellites. B.J. (IAA)

N86-20194# Joint Publications Research Service, Arlington, Va.
MEAN DENSITY OF METEOR STREAM INCIDENT ON EARTH Abstract Only c90
P. B. Babadzhanov, R. Sh. Bibarsov, V. S. Getman, and V. M. Kolmakov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 89-90 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 4, Oct. 1985 p 824-826 Original language document was announced in IAA as A86-14580 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The average density of the flux of meteoroid bodies falling onto the Earth is determined over a wide mass range (0.001 to 100 g) using comprehensive photographic and radar observational data covering a period from 1957 to date. The characteristics of the falling flux of meteoroids are determined using a simple method which eliminates the effect of most of the factors associated with the selectivity of instruments. The results obtained are in good agreement with those reported by Hughes (1972). V.L. (IAA)

N86-20195# Joint Publications Research Service, Arlington, Va.
ONE CASE OF DETERMINATION OF ELEMENTS OF INTERMEDIATE ORBIT Abstract Only c13
Ye. L. Lukashevich *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 90-91 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 308-310 Original language document was announced in IAA as A85-35245 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A procedure for determinining the elements of an intermediate orbit on the basis of rectangular geocentric equatorial coordinates and their derivatives is described. This procedure makes it possible to account for all perturbations due to the second zonal harmonic of the geopotential as well as for secular and partially periodic perturbations due to an arbitrary even zonal harmonic. B.J. (IAA)

N86-20196# Joint Publications Research Service, Arlington, Va.
ANALYTICAL EVALUATIONS OF ACCURACY IN DETERMINING AND PREDICTING PARAMETERS OF ARTIFICIAL EARTH SATELLITE MOTION USING ALTIMETER MEASUREMENT DATA Abstract Only c13
M. P. Nevolko and Ye. L. Mosin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 91 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 310-314 Original language document was announced in IAA as A85-35246 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The proposed analytical estimation procedure is based on the methods of Porfir'ev and Smirnov (1968) and Bychkov and Boginskii (1972). It is shown that the main contribution to the prediction error according to the radius vector as well as along the orbit is from variations of atmospheric density. B.J. (IAA)

N86-20197# Joint Publications Research Service, Arlington, Va.
DIRECTIVITY OF PROTON FLUX WITH E SUB p > 12 KeV IN LOW-LATITUDE TRANSITION REGION Abstract Only c46
K. Kudela, V. N. Lutsenko, N. F. Pisarenko, Y. Royko, and S. Fisher *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 92 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 317-319 Original language document was announced in IAA as A85-35248 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The Prognoz-8 satellite measured the directional and temporal characteristics of protons with energies exceeding 12 keV in the low-latitude transition region in the upper atmosphere. The distribution of the proton fluxes in this region was found to have the character of unidirectional and bidirectional beams along or antiparallel to magnetic field lines; the main direction of the flux is from the magnetopause to the transition region. Bidirectionality, observed at low absolute values of B over a large part of the spacecraft trajectory in passing through the transition region, is a characteristic feature of the proton fluxes. B.J. (IAA)

N86-20198# Joint Publications Research Service, Arlington, Va.
EVOLUTION OF ALMOST CIRCULAR ORBITS OF 12-HOUR ARTIFICIAL EARTH SATELLITES Abstract Only c13
M. A. Vashkovyak *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 93 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 3-15 Original language document was announced in IAA as A85-28483 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

An analysis of the evolution of almost-circular orbits of satellites with a revolution period of about 12 hours and an inclination not exceeding 90 deg is presented. Approximate formulas are obtained for the secular and long-period perturbations of the orbital elements under the effect of lunar and solar attraction, optical radiation pressure, and the noncentrality of the terrestrial gravitational field. The quantitative and qualitative characteristics of orbital evolution which are obtained are confirmed by numerical-analytical calculations for a time period of about 1000 days. B.J. (IAA)

N86-20199# Joint Publications Research Service, Arlington, Va.
COMPARISON OF CONDITIONALLY PERIODIC SOLUTIONS WITH RESULTS OF NUMERICAL INTEGRATION IN PROBLEM OF TRANSLATIONAL-ROTATIONAL SATELLITE MOTION Abstract Only c13
A. A. Zlenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 93-94 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 16-25 Original language document was announced in IAA as A85-28484 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Consideration is given to the translational-rotational motion of an axisymmetric satellite in a circular equatorial orbit in the gravitational field of a homogeneous triaxial ellipsoid. Stationary and conditional-periodic (CP) motions of the satellite in the presence of double resonance are determined. The CP solutions are compared with results of the numerical integration of the exact equations of motion for a hypothetic synchronously rotating stationary satellite and a hypothetic nonsynchronously rotating 48-hour satellite. B.J. (IAA)

N86-20200# Joint Publications Research Service, Arlington, Va.
OBLIQUE REGULAR SATELLITE MOTIONS AND SOME FINE EFFECTS IN MOTION OF MOON AND PHOBOS Abstract Only c13
Yu. V. Barkin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 94-95 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 26-36 Original language document was announced in IAA as A85-28485 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The stationary motions of a satellite with an arbitrary dynamic structure in a central field are investigated. This problem is shown to admit solutions which corresponds to relative equilibrium points of the satellite which differ from (through they are close to) the Lagrangian equilibrium points. Specifically, oblique satellite positions in circular orbit are possible for which the principal central axes of inertia do not coincide with the axes of the orbital coordinate system, though they are close to these axes. The solutions obtained make it possible to explain the observed constant angular displacements of the inertia axes of the Moon and to predict analogus effects in the motion of Phobos as well as the constant dynamic displacements of the mass centers of these bodies. B.J. (IAA)

N86-20201# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF OPTIMUM TRAJECTORIES FOR ORBITAL INSERTION FROM ANY POINT OF WHICH DESCENT INTO ATMOSPHERE IS POSSIBLE WITH STIPULATED RESTRICTIONS Abstract Only c13
V. A. Ilin and A. S. Filatyev *In its* USSR Report: Space

(JPRS-USP-86-001) 13 Jan. 1986 p 95 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 37-48 Original language document was announced in IAA as A85-28486 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The paper examines the synthesis of optimal trajectories of orbital injection from any point of which the descent module can return to the atmosphere without violation of restrictions pertaining to dynamics and/or thermal loads. The problem is characterized by branching trajectories with an infinite number of branches in the inner points of which restrictions are imposed on the phase variables. The solution is obtained by the substitution of phase restrictions on the descent trajectory by equivalent restrictions on the thrust vector orientation in the current point of the injection trajectory. As an example, attention is given to the optimization of an injection trajectory from any point of which spacecraft descent is possible without a violation of the velocity-head restriction.
B.J. (IAA)

N86-20202# Joint Publications Research Service, Arlington, Va.
APPLICATION OF RELATIVISTIC THEORY TO PROBLEMS OF SPACE VEHICLE TRAJECTORY MEASUREMENTS Abstract Only **c13**
V. S. Chaplinskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 96 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 49-62 Original language document was announced in IAA as A85-28487 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Initial relationships for the coupling of electromagnetic-signal parameters in reference systems specified for spacecraft trajectory measurements are obtained. The main interpretive expressions for determining navigation functions are obtained which take into account relativistic transformations of signals in near-earth space with an accuracy sufficient for practical applications. It is shown that the use of the relationships obtained to determine navigation parameters on the basis of direct and sum-difference frequency-phase measurements makes it possible to preserve the instrumental accuracy of direct measurements. B.J. (IAA)

N86-20203# Joint Publications Research Service, Arlington, Va.
STABILITY OF DIAMAGNETIC PLASMOID IN MAGNETOSPHERE Abstract Only **c46**
S. V. Leontyev, V. B. Lyatskiy, and A. A. Khrushchinskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 96-97 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 100-105 Original language document was announced in IAA as A85-28491 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The test-particle method is used to investigate the stability of a diamagnetic cluster (DC) of hot particles in the magnetosphere, and the possibility of DC generation in regions connected with active processes during substorms is assessed. The boundaries of regions of particle capture by the cluster oscillating along magnetic field lines are calculated, and the capture region is found to expand with an increase in the magnetic disturbance produced by the cluster. In addition, it is shown that, in order to generate a stable DC in the magnetosphere, it is necessary to have an injection of sufficiently intense fluxes of accelerated particles causing a significant disturbance in the magnetic field. The energy density of accelerated ion fluxes reaches a value of 3 x 10 to the -8th erg/cu cm, which produces 1-nT disturbance in the magnetic field inside the cluster. B.J. (IAA)

N86-20204# Joint Publications Research Service, Arlington, Va.
ENERGY DISTRIBUTIONS OF PROTONS WITH 0.05 < OR = E < OR = 50 MeV IN EARTH'S RADIATION Abstract Only **c46**
M. I. Panasyuk and E. N. Sosnovets *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 97-98 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 106-112 Original language document was announced in IAA as A85-28492 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Molniya-2-satellite data on differential energy spectra of protons with an energy of 0.05-50 MeV in the radiation belts (RBs) are analyzed. The existence of two different mechanisms for the formation of a maximum in the spectra is indicated. In the outer RB, the formation of the maximum at energies of the order of 100 keV is due to loss mechanisms (charge transfer and Coulomb collisions) during proton transport toward the Earth. In the inner RB, the most probable mechanism of maximum formation at energies in the MeV range is a resonance mechanism connected with quasi-period fluctuations of the geomagnetic field. These fluctuations (along with the observed predominance of LF Pc3-Pc-4 waves in the magnetosphere) are the most likely cause of an increase in the diffusion coefficient of high-energy RB protons.
B.J. (IAA)

N86-20205# Joint Publications Research Service, Arlington, Va.
DYNAMICS AND PREDICTION OF RADIATION CHARACTERISTICS OF SOLAR COSMIC RAYS Abstract Only **c93**
V. V. Bengin, L. I. Miroshnichenko, and V. M. Petrov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 98 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 123-133 Original language document was announced in IAA as A85-28494 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A probabilistic method for the prediction of the radiation characteristics of solar cosmic rays (SRC) based on a priori information about the parameters of solar proton events (SPE) is proposed with reference to radiation-safety assurance for spacecraft flight crews and equipment. Particular consideration is given to: (1) the prediction algorithm; (2) choice and comparison of SPE models; (3) construction of distribution functions of various SPE parameters; (4) construction of a priori probability density function of SPE parameters; and (5) validation of the full scheme for the prediction of SPE dynamics. The effectiveness of the proposed method for the prediction of SCR flux dynamics is demonstrated, and attention is given to the possibility of improving the method by taking into account a priori information about the spectrum and physical limits of the parameters of SCR progation. B.J. (IAA)

N86-20206# Joint Publications Research Service, Arlington, Va.
INTERPLANETARY DISTURBANCE FROM FLARE TRIPLET IN MAY 1981 AS OBSERVED BY PROGNOZ-8 Abstract Only **c91**
G. N. Sastenker, N. L. Borodkova, K. G. Ivanov, and N. V. Mikerina *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 99 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 134-142 Original language document was announced in IAA as A85-28496 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Prognoz-8-satellite data are used to investigate an interplanetary disturbance from a series of three intense solar flares which arose in an active region near the helioprojection of the Earth in May 1981. Please and magnetic measurements showed that the disturbance was characterized by a complete absence of intense fast shock waves, a very high particle concentration, and an equality of temperatures of protons and alpha particles. These features confirm the hypothesis of the intense attenuation of shock waves from series flares due to their interaction with each other and with flare ejections long before arrival at the Earth.
B.J. (IAA)

N86-20207# Joint Publications Research Service, Arlington, Va.
O+-He AND H+-He MEAN COLLISION FREQUENCIES FOR IONOSPHERIC RESEARCH Abstract Only **c46**
A. V. Pavlov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 99-100 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985

p 143-147 Original language document was announced in IAA as A85-28496 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The model of polarizational dipole interaction is commonly used in ionospheric physics to calculate mean collision frequencies with momentum transfer nu(in) for nonresonant interactions of ions with neutral particles. It is know that, for planetary ionospheres, nu(in) values for O(+)-He and (+)-He interactions should be calculated in the approximation of the more real potential (12, 6, 4). An approximation of reduced collision integrals included in nu(in) is proposed for typical atmospheric values of reduced temperatures. This makes it possible to obtain an analytical expression for nu(in). Compared with the more precise values of nu(in) in the approximation of the potential (12, 6, 4), the use of commonly accepted expressions for nu(in) leads to errors in upper-atmospheric conditions: 8-23 percent for H(+)-He and 20-50 percent for O(+)-He. The results are of significance for the modeling of the Venus ionosphere. B.J. (IAA)

N86-20208# Joint Publications Research Service, Arlington, Va.
NUMERICAL MODELING OF INTERACTION BETWEEN SOLAR WIND AND COMETARY PLASMA Abstract Only c92
A. S. Lipatov *In its* USSR Report: Space (JPRS-USP-86-0010 13 Jan. 1986 p 100 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 158-166 Original language document was announced in IAA as A85-28498 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The collisionless particle-in-cell technique is used to study the interaction of the solar wind with heavy cometary ions and the related magnetic-field dynamics. An analysis is made of the parameters of the solar-wind stagnation zone. The structure of the external shock wave and transition region, and the configuration of the induced magnetosphere. It is concluded that the passage of a solar-wind stream through a near-cometary region produces an entrainment of the ionized component of the comet, leading to the formation of a stream of the ionized component of the comet, leading to the formation of a stream of cometary ions with a characteristic temperature that is significantly greater than the temperature transverse to the magnetic field as well as the proton stagnation temperature. The comet is specifically characterized by the presence of energetic ions at the shock front. Therefore the thickness of the shock front and the structure of the transition region have a characteristic scale that is determined by the Larmor radius of the heavy ion. B.J. (IAA)

N86-20209# Joint Publications Research Service, Arlington, Va.
USE OF DIFFERENTIAL VERY LONG BASELINE RADIOINTERFEROMETRY IN ASTRONAVIGATION Abstract Only c17
L. R. Kogan, L. I. Matveyenko, and V. I. Kostenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 101 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 167-174 Original language document was announced in IAA as A85-28499 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

It is shown that differential VLBI can determine the coordinates of spacecraft with high accuracy. The accuracy with which the relative coordinates of spacecraft can be determined can be reduced to fractions of a milli-arcsec. A quasar or a spacecraft can be used as the reference source. The accuracy of absolute measurements of spacecraft coordinates (with allowance for quasar-coordinate errors) can be of the order of 10 milli-arcsec. Absolute measurements of the coordinates of the Giotto spacecraft in the Comet Halley mission are considered as an example. B.J. (IAA)

N86-20210# Joint Publications Research Service, Arlington, Va.
NUMERICAL INVESTIGATIONS OF RESONANCE INEQUALITIES OF LOW ORBIT ARTIFICIAL EARTH SATELLITES Abstract Only c13
V. L. Travin and S. N. Yashkin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 102 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 53-57 Original language document was announced in IAA as A85-19996 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The sharp-resonance region of satellites with different inclinations, eccentricities, and commensurabilities is analyzed with reference to the solution of space-geodesy problems. As an example, the width of the libration zone is determined for the principal commensurabilities for an inclination of 60 deg and an eccentricity of 0.01. This width is shown to to significantly dependent on the inclination; this dependence increases substantially as the orbit comes closer to the Earth; for almost circular orbits, the width of the libration zone is only several meters. B.J. (IAA)

N86-20211# Joint Publications Research Service, Arlington, Va.
DETERMINING SATELLITE ORBIT FROM TWO VELOCITY VECTORS Abstract Only c13
I. V. Onkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 102-103 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 57-61 Original language document was announced in IAA as A85-19997 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A method is proposed for determining the Keplerian orbit of an artificial satellite of the Earth or of a planet according to two velocity vectors given at known moments of time. The method relies on a Newtonian orbit-parameter iteration procedure. A numerical example is presented for an Earth satellite with the following orbital elements: a = 6700 km, e = 0.01, i = 1 rad, Omega = 0 deg, omega = 0 deg, and M(0) = 0 deg. It is concluded that the proposed algorithm is sufficiently simple and that the convergence speed of the iterative procedure is high. B.J. (IAA)

N86-20212# Joint Publications Research Service, Arlington, Va.
USE OF DOPPLER EFFECT IN DETERMINING ANGULAR COORDINATES OF ARTIFICIAL EARTH SATELLITE Abstract Only c13
R. Durdyyev and A. Ibrayimov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 103 Transl. into ENGLISH from Izvestiya Akademii nauk Turkmenskoy SSR: Seriya Fiziko-Tekhnicheskikh, Khimicheskikh i Geologicheskikh Nauk (Ashkhabad, USSR), no. 2, Mar. - Apr. 1985 p 31-35 Original language document was announced in IAA as A85-10644 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The paper describes a technique of using the Doppler effect to determine satellite angular coordinates in ionospheric sounding studies. The proposed approach can also be used to predict the time of entry of a satellite into the radio-visibility zone. B.J. (IAA)

N86-20213# Joint Publications Research Service, Arlington, Va.
MODELING CHARGED PARTICLE FLUXES ALONG SPACE VEHICLE FLIGHT TRAJECTORIES IN EARTH'S RADIATION BELTS Abstract Only c46
O. I. Savun and B. Yu. Yushkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 104 Transl. into ENGLISH from Vestnik Moskovskogo Universiteta, Seriya 3: Fizika, Astronomiya (Moscow, USSR), v. 26, no. 1, Jan. - Feb. 1985 p 3-8 Original language document was announced in IAA as A85-36596 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A method has been developed to calculate the energies of electrons and protons along the trajectories of spacecraft in the Van Allen radiation belts. Variations due to the phases of the solar cycle were taken into account. The obtained energies were in the ranges 0.1 to 400 MeV for protons; and 40 keV to 4 MeV for electrons. Numerical integrations of the particle energy spectra for a 24-hour period were used to estimate the amount of radiation absorbed by various shielding materials during one orbit.

Numerical results are also presented for electron energies at altitudes lower than the radiation belts. I.H. (IAA)

N86-20214# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF NONPOLAR LATITUDE VARIATIONS Abstract Only **c89**
A. A. Korsun *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 105 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 1, Jan. 1985 p 78-80 Original language document was announced in IAA as A85-48687 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The nonpolar variation in the latitude of the Earth (z-term variation) due to nontidal deformations of the geoid is calculated. It is shown that the z-term estimates are free of error due to stellar declination and proper motion. The contribution of individual harmonics to the mean z-term fluctuations is assessed. I.H. (IAA)

N86-20215# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF PARAMETRIC APPROACH TO STUDY ON PREFLARE PHENOMENA IN SOLAR PLASMA BY ANALYSIS OF SOLAR RADIO EMISSION FLUCTUATIONS Abstract Only **c92**
Ye. A. Averyanikhina, M. M. Kobrin, and I. Ya. Orlov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 105-106 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 28, no. 1, Jan. 1985 p 3-10 Original language document was announced in IAA as A85-26726 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Since one of the most important problems in studies of the physics of active regions on the Sun is an investigation of preflare processes in solar plasma, the authors examined some additional possibilities for obtaining information on processes in active regions by regarding them as plasma parametric systems. An analysis was made of fluctuations of preflare solar radio emission, including the nature of changes in amplitudes, energy spectra and probability distribution functions. Data were used on integral solar radio emission at a frequency of 755 MHz made at the Radioastrophysical Observatory, Latvian Academy of Sciences, using the RT-10 radio telescope from June through August 1979 to 1980, a period of the solar maximum. About 40 observations were selected, during which 12 powerful radiobursts associated with proton flares were observed. The pertinent parameters were analyzed before and after flares. A comparison of the results of observation of these fluctuations and the results of modeling indicated a modulation-multiplicative nature of the interaction between noise radiation and quasiperiodic processes on the Sun. It is concluded that the agreement of the dynamic effects of the probability density function obtained from the results of observations in the preflare period and the results of analog and mathematical modeling, as well as comparison of experimental studies of parametric systems, give a sound basis for regarding solar activity processes as processes in a parametric system. This finding will be useful in physical interpretation of preflare phenomena and in predicting solar activity. Author

N86-20216# Joint Publications Research Service, Arlington, Va.
EVALUATIONS OF EXTERNAL VALUES OF INTEGRAL PROTON FLUXES IN FLARES IN PLANNING OF SPACE FLIGHTS Abstract Only **c92**
A. Kolomenskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 106 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 315-316 Original language document was announced in IAA as A85-35247 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A method for estimating extremum values of proton fluxes in solar flares is developed with preference to space-experiment planning and the protection of spacecraft radar equipment from flare particles. An analytical expression is derived for the dependence of the probability of occurrence of intense flares on the flight duration. Maximum integral proton fluxes for flight durations of one and two years are estimated. B.J. (IAA)

N86-20217# Joint Publications Research Service, Arlington, Va.
INTERVIEW WITH KOVTUNENKO, VEGA PROJECT HEAD **c12**
M. Rebrov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 107-113 Transl. into ENGLISH from Krasnaya Zvedzda (Moscow, USSR), 20 Jul. 1985 p 3 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

An interview with V. Kovtunenko, head of the U.S.S.R. Vega project, is given. International cooperation, space probe meteoroid protection, weight reduction, and scientific objectives of the mission to Halley's comet are discussed. R.J.F.

N86-20218# Joint Publications Research Service, Arlington, Va.
RESULTS ON INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 Abstract Only **c12**
V. I. Moroz, V. M. Linkin, and D. Ertel *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 114-115 Transl. into ENGLISH from Uspekhi Fizicheskikh Nauk (Moscow, USSR), v. 146, no. 2, Jun. 1985 p 346-348 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

During the period October to December 1983 about 1,500 IR spectra of Venus were transmitted from the artificial satellites, Venera-15 and Venera-16. The spectra were registered in the range 250 to 1600 0.01 cm. The field of view (about 4 deg) made it possible to discriminate sectors with a dimension of about 60 km (near orbital pericenter) on the planet. These measurements of outgoing thermal radiation of Venus with a satellite-borne spectral instrument were made for the first time and took in latitudes from -66 to 87 deg. The most conspicuous detail in the spectra is the CO2 absorption band 667 0.01 cm (15 microns). The profile of the band 15 m was used in retrieving the dependence of temperature on altitude from approximately 60 to 90 km. The full profile of the 15 micron band was observed for the first time in the Venusian spectrum. The lines of the H2O rotational band were also registered for the first time in the thermal emission spectrum of Venus. Sulfuric acid bands can also be identified. Within the 15 micron band different parts of the spectrum are formed at different altitudes. By solving the inverse radiative transfer problem, the atmospheric temperature profile can be retrieved from each spectrum. R.J.F.

N86-20219# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 1: METHODS AND FIRST RESULTS Abstract Only **c43**
D. Oertel, V. I. Moroz, I. Nopirakovskiy, V. M. Linkin, H. Jahn, R. S. Kremnev, H. Becker-Ross, W. Stadthaus, V. V. Kerzhanovich, I. A. Matsygorin et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 115 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 191-205 Original language document was announced in IAA as A85-35235 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Infrared Fourier spectrometers on Venera 15 and 16 obtained spectra of Venus in the 250 to 1600/cm range (40 to 6 microns) with a resolution of approximately 5/cm. The measurements were made primarily along paths situated in the Northern Hemisphere at latitudes not below 20 deg. The design of the instrument is described along with its characteristics and the program of operations in orbit. Sample spectra and brightness-temperature profiles along the measurement path are presented, and some of their characteristics are noted, including the different character of the spectra in polar and medium latitudes, the presence of hot spots, and the absence of thermal asymmetry. B.J. (IAA)

N86-20220# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16

AUTOMATIC INTERPLANETARY STATIONS. 2: PRELIMINARY RESULTS OF TEMPERATURE PROFILE RETRIEVAL Abstract Only c43

D. Spankuch, L. V. Zasova, K. Schafer, Ye. A. Ustinov, Yu. Gyuldner, V. I. Moroz, W. Dohler, V. M. Linkin, R. Dyubua, A. V. Dyachkov et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 116 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 206-220 Original language document was announced in IAA as A85-35236 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Thermal-emission spectra of Venus obtained by Venera 15 and 16 were used to determine the temperature profile in the Venus atmosphere at heights of 60 to 95 km. The obtained profiles show that the temperature decreases monotonically with increasing height inside the latitude zone of +, -60 deg. At higher latitude the atmosphere is warmer, and inversion or isothermal conditions are observed at a level of 10 to 100 mbar. Diurnal variations of temperature were not observed B.J. (IAA)

N86-20221# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 3: SOME CONCLUSIONS ON CLOUD STRUCTURE BASED ON ANALYSIS OF SPECTRA Abstract Only c43

L. V. Zasova, D. Spankuch, V. I. Moroz, K. Schafer, Ye. A. Ustinov, W. Dohler, V. M. Linkin, D. Oertel, A. V. Dyachkov, H. Becker-Ross et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 117 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 221-235 Original language document was announced in IAA as A85-35237 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Venera 15 and 16 spectra of different latitude zones of Venus in the 250 to 1650/cm range are analyzed. It is shown that differences in the spectra of different zones can be partly explained by differences in the structure of the cloud layer. At low latitudes (phi less than 60 deg) the cloud layer is sparse, and diurnal variations are not observed. At latitudes of 65 to 78 deg, a longitudinally extended but open region of elevated particle concentration exists. The upper cloud boundary in the hot-spot region (phi = 78 to 82 deg) is located lower than in other parts of the planet. B.J. (IAA)

N86-20222# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 4: PRELIMINARY RESULTS OF ANALYSIS OF SPECTRA IN REGION OF H2O AND SO2 ABSORPTION BANDS Abstract Only c43

V. I. Moroz, W. Dohler, Ye. A. Ustinov, K. Schafer, L. V. Zasova, D. Spankuch, A. V. Dyachkov, R. Dyubua, V. M. Linkin, D. Oertel et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 118 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 236-247 Original language document was announced in IAA as A85-35238 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

A large group of absorption features belonging to the rotational band is identified along with the fundamental rotational-vibrational band nu2 of H2O. Two SO2 absorption bands are identified: nu2 at 519/cm and nu3 at 1360/cm. Preliminary estimates show that the H2O mixture ratio is 30 ppm at a height of 85 km, and that the SO2 mixture ratio is 2 ppm at 66 km. Both quantities (obtained from spectra determined at medium latitudes on October 14, 1983) were determined with an accuracy up to a factor of approximately 3. B.J. (IAA)

N86-20223# Joint Publications Research Service, Arlington, Va.
INFRARED EXPERIMENT ON VENERA-15 AND VENERA-16 AUTOMATIC INTERPLANETARY STATIONS. 5: PRELIMINARY RESULTS OF ANALYSIS OF BRIGHTNESS TEMPERATURE AND HEAT FLOW FIELDS Abstract Only c43

V. M. Linkin, K. Schafer, I. A. Matsygorin, W. Dohler, V. I. Morozn, R. Dyubua, A. V. Dyachkov, D. Spankuch, V. V. Kerzhanovich, D. Oertel et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 118-119 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 248-258 Original language document was announced in IAA as A85-35239 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Venera-15 infrared data were represented in the following ways: latitude dependence of brightness temperature for selected wave numbers; dependence of brightness temperature on date and solar time for selected latitudes; and analogous dependences for the spectrum (flux) integral. A preliminary analysis shows the existence of three characteristic regions in the Northern Hemisphere of Venus: low latitudes (40 to 60 deg) where the brightness temperatures and fluxes are constant; a cold zone (60 to 75 deg), with large variations; and a warm polar cap (phi greater than 75 deg). It is shown that thermal asymmetry is absent at latitudes below 60 deg, that hot spots may occur in pairs, and that the cold zone does not rotate together with the atmosphere. B.J. (IAA)

N86-20224# Joint Publications Research Service, Arlington, Va.
VENUSIAN INFRARED RADIATION: APPROXIMATE METHODS FOR COMPUTING SPECTRUM IN ABSORPTION BANDS OF ATMOSPHERIC GASES Abstract Only c91

V. I. Moroz and L. V. Zasova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 119-120 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 259-267 Original language document was announced in IAA as A85-35240 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Approximate methods for calculating synthetic spectra in the H2O, CO2, and SO2 absorption bands are described which are used for a quantitative interpretation (chemical analysis and determination of cloud-layer parameters) of results of the Venera 15 and 16 infrared experiment. A simplified version of the line-by-line method is used for H2O; an equidistant-line method is used for CO2; and the overlapping-line method is used for CO2; and the overlapping-line method is used for SO2. B.J. (IAA)

N86-20225# Joint Publications Research Service, Arlington, Va.
VENUSIAN IMPACT CRATERS ON RADAR IMAGES OF VENERA-15 AND VENERA-16 SPACECRAFT Abstract Only c91

A. T. Bazilevskiy, B. A. Ivanov, V. P. Kryuchkov, R. O. Kuzmin, A. A. Pronin, and I. M. Chernaya *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 120-121 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 671-674 Original language document was announced in IAA as A85-39150 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Venera-15 and Venera-16 radar image data are presented and discussed. It is found that the morphology and formation mechanisms of Venusian impact craters do not differ greatly from those on planets whose surface conditions are drastically different from those of Venus. It is suggested that the higher temperature of target rocks on Venus leads to the formation of quantities of impact vapor and melt per unit of impactor energy that are greater than those for other terrestrial planets. B.J. (IAA)

N86-20226# Joint Publications Research Service, Arlington, Va.
VENUSIAN EXOGENOUS PROCESSES AND SURFACE ROUGHNESS DETERMINED FROM RADAR OBSERVATIONS Abstract Only c91

V. P. Kryuchkov and A. A. Pronin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 121 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 268-275 Original language document was announced in IAA as A85-35241 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Earth-based and Pioneer-Venus radar observations of the

Venus surface were used to analyze the two-scale (centimeter and meter-decameter) roughness distribution at different hypsometric levels. The distribution of roughness classes with change in height is compared with the character of the hypsometric curve, which made it possible to identify the height zonality of roughness. These zones are characterized from the viewpoint of exogenetic processes on the basis of a comparison of geological situations at the landing sites of the Venera 9, 10, 13, and 14 with the degree of roughness in these areas. B.J. (IAA)

N86-20227# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF ERRORS IN RESULTS OF RADIO PROBING OF DAYTIME VENUSIAN IONOSPHERE CAUSED BY ITS ASPHERICITY Abstract Only c91
A. L. Gavrik and L. N. Samoznayev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 122 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 148-157 Original language document was announced in IAA as A85-28497 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Errors in the determination of electron density due to the use of the spherically symmetric approximation are evaluated on the basis of a model of the daytime Venusian ionosphere based on data of two-frequency radio occultation by the Venera-9, 10 probes. It is shown that the error in the determination of electron density profiles N(h) due to asymmetry did not have a significant influence on the radio-occultation results. In addition, the error due to radial variations of the solar zenith angle in the ionosphere had practically no effect on the determination of electron density distribution in the regions of the principal and lower ionization maxima. It is shown, however, that variations of ionopause height with solar zenith angle can lead in a number of cases to significant errors in the determination of the vertical extent of the daytime ionosphere and the height scales of electron density distribution in the upper ionosphere in the framework of the spherically symmetric approximation. B.J. (IAA)

N86-20228# Joint Publications Research Service, Arlington, Va.
PRINCIPAL TYPES OF STRUCTURES IN VENUSIAN NORTHERN HEMISPHERE Abstract Only c91
V. L. Barsukov, A. T. Bazilevskiy, R. O. Kuzmin, M. S. Markov, V. P. Kryuchkov, O. V. Nikolayeva, A. A. Pronin, A. L. Sukhanov, I. M. Chernaya, G. A. Burba et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 122-123 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 1, Jan. - Mar. 1985 p 3-14 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Mapping of the Venusian Northern Hemisphere has made it possible to draw a whole series of important conclusions concerning the planet. There is no evidence of activity of liquid water. If a hydrosphere ever existed, it disappeared much more than a billion years ago. At the survey scale it is impossible to detect evidence of eolian erosion or redeposition. If the planet ever rotated more rapidly and stronger winds prevailed, this much have been over a billion years ago. Due to the weakness of exogenous reworking, in the Venusian relief there is a clear expression of deep dislocations corresponding in age to the Proterozoic complex on the Earth (on the Earth only observed t considerable depths). Tectonic dislocations of three types predominate on Venus: concentric annular voids, zones of linear folded-faulted dislocations and parquette dislocations. The latter constitute a phenomenon caused by a high temperature at the planetary surface, as a result of which large plates of the thin crust move along a plastic substrate or are entrained by it and are rumpled, hummocked and dilatated. Venus is not a single-plate planet, like the Moon or Mercury; its crust is distinctly broken into individual blocks with independent movements. It appears that extensive basaltic volcanism is a universal factor in evolution of planets of the Earth type. The rarity of impact craters in the ancient relief indicates that they disappear rather rapidly due to a number of possible mechanisms. Author

N86-20229# Joint Publications Research Service, Arlington, Va.
RADIATIVE HEAT TRANSFER AND WATER CONTENT IN VENUSIAN ATMOSPHERE Abstract Only c91
M. Ya. Marov, A. P. Galtsev, and V. P. Shari *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 123-124 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 1, Jan. - Mar. 1985 p 15-41 Original language document was announced in IAA as A86-11963 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Procedures for calculating the optical characteristics of the mean components and effective fluxes of the atmosphere of Venus are presented, and some theoretical results are compared with the available experimental data and other atmospheric optics models. Attention is given to the problem of correctly estimating the absorption spectra of the main gaseous components (CO2, H2O, and SO2) at their respective temperatures, pressures, and abundances. It is shown that the conditions of thermal equilibrium in the undercloud atmosphere of Venus correspond to a water vapor adundance of about 0.0001. Some possible sources of error in the theoretical calculations are discussed. I.H. (IAA)

N86-20230# Joint Publications Research Service, Arlington, Va.
MODEL OF COMPOSITION OF MARTIAN IONOSPHERE IN PHOTOCHEMICAL EQUILIBRIUM REGION Abstract Only c91
A. V. Pavlov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 124 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 276-282 Original language document was announced in IAA as A85-35242 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A model is developed for the composition of the daytime Martian ionosphere at heights of 110-220 km, comprising zones of O2(+), CO2(+), O(+), H(+), He(+), NO(+), C(+), N(+), CO(+), N2(+), CO2H(+), COH(+), OH(+), and electrons. Calculation results agree well with Viking-1 measurements of ion concentration. A group of O(+), O2(+), CO2(+), CO(+), and C(+) ions is identified whose concentrations does not depend (within an error or 20 percent) on the concentration of other kinds of ions. Analytical expressions are obtained for ion concentration and electron density. The relative error of calculations of the electron density (due to errors in measuring the model input data) mounts to 18 to 25 percent. B.J. (IAA)

N86-20231# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ANALYSIS OF VOLCANIC EFFECT ON CLIMATE OF EARTH AND MARS Abstract Only c91
K. Ya. Kondratyev, N. I. Moskalenko, S. N. Parzhin, and S. Ya. Skvortsova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 125 Transl. into ENGLISH from Izvestiya Akademii Nauk SSR: Fizika Atmosfery i Okeana (Moscow, USSR), v. 21, no. 5, May 1985 p 451-459 Original language document was announced in IAA as A85-40637 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A comparative analysis of recent planetological data was carried out to determine the specific effects of gaseous atmospheric components on planetary climates, with emphasis given to the effect of volcanic aerosol cloud formation on the greenhouse effect. In connection with sporadic variations in the intensity of volcanic activity on Earth and Mars, a temporal modulation with warm and cold periods was found. It is shown that SO2 and volcanic aerosols have had significant influence on the formation of climate during the early stages of the evolution of Earth and Mars. I.H. (IAA)

N86-20232# Joint Publications Research Service, Arlington, Va.
GLOBAL RESONANCE OF JOVIAN RADIATION BELTS Abstract Only c91
P. A. Bespalov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 126 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 1, Jan. 1985 p 72-77 Original language document was announced in IAA as A85-48686 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

The oscillation regimes of cyclotron stability in the Jovian radiation belts are analyzed. It is shown that the eigenfrequencies of oscillations in the outer magnetosphere of Jupiter are independent of the magnetic shell L and coincide with the angular rotational velocity. The theoretical results are used to explain Pioneer observations of 10-hour modulation in the energetic electron flux of Jupiter. I.H. (IAA)

N86-20233# Joint Publications Research Service, Arlington, Va.
PRELIMINARY RESULTS OF DETERMINATIONS OF PHYSICAL PROPERTIES OF MICROFRAGMENTS OF LUNAR ROCKS FROM SOIL RETURNED BY LUNA-16 AND LUNA-20 STATIONS Abstract Only **c91**

G. I. Gorbunov, R. V. Medvedev, and V. V. Chashnikov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 126-127 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 283, no. 3, Jul. 1985 p 601-604 Original language document was announced in IAA as A85-48686 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

A number of Luna vehicles returned with samples of lunar soil (basalts, anorthosites, breccias, slags, glass). Special methods were required for working with microfragments measuring a fraction of a millimeter. The tested particles were selected in the Comparatice Planetology Laboratory, Geochemical and Analytical Chemistry Institute. They include: two samples of melanoratic basalts, two samples of anorthositic gray rock, breccia, four types of glass from mare and continental regions, one light-colored breccia, one dark gray porous slag particle, three grains of rock-forming minerals (pyroxene with numerous inclusions, light-yellow olivine of irregular configuration and a transparent grain of plagioclase. The following parameters were determined: density, longitudinal elastic modulus, heat capacity, compressive strength, Young modulus. All these determinations are tabulated. The results of these tests of microsamples of lunar rocks agree with determinations made in the United States with macrosamples and also with averaged indices of properties for similar terrestrial rocks. The collected data can be useful for interpreting lunar geophysical data. Author

N86-20234# Joint Publications Research Service, Arlington, Va.
POLARIMETRIC STUDIES OF MOON AND PLANETS AT ABASTUMANI ASTROPHYSICAL OBSERVATORY Abstract Only **c91**

V. P. Dzhapiashvili, O. R. Bolvadze, O. I. Kvaratskheliya, A. N. Korol, and L. A. Sigua *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 127-128 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 1, Jan. - Mar. 1985 p 77-85 Original language document was announced in IAA as A86-11967 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Abastumani Observatory has long been noted for polarimetric investigations of celestial bodies. Such observations are made using the 40-cm F/17 Zeiss refractor which is free of instrumental polarization. A significant series of lunar brightness images was obtained and these were used in publishing an atlas containing 21 such lunar maps for different phase angles. A detailed study was made of more than a hundred different features on the Moon, with particular attention being devoted to the accuracy in measuring maximum and minimum polarization and the inversion angle in different parts of the spectrum. Exotic phenomena were discovered on the Moon, especially near Aristarchus Crater, where high degrees of polarization of several small surface sectors were repeatedly measured. Polarimetric observations at the observatory have been made since 1967. Observations were made on 170 nights and more than 10,000 individual measurements were made. This made possible a clear visualization of the quantitative picture of the distribution of polarization over the apparent disk and the nature of its change over a long time interval. R.J.F.

N86-20235# Joint Publications Research Service, Arlington, Va.
CHANGE IN ANGULAR POSITION OF SPACECRAFT BY SYSTEM OF FLYWHEEL MOTORS WITH NONZERO INITIAL KINETIC MOMENT Abstract Only **c18**

K. B. Alekseyev and O. V. Zlodyreva *In its* USSR Report: Space (JPRS-USP-86-0010 13 Jan. 1986 p 129 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Mekhanika Tverdogo Tela (Moscow, USSR), no. 3, May - Jun. 1985 p 2-7 Original language document was announced in IAA as A85-44809 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

An analytical solution is presented for the problem of controlling the spatial reorientation of a spacecraft by executing a single two-dimensional turn with the aid of a system of flywheels having nonzero initial kinetic moments. Algorithms are obtained which make it possible to determine a program of change in the control stresses at the flywheel drives that is optimum with respect to the time of response, with certain natural constraints taken into account. V.L. (IAA)

N86-20236# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF AERODYNAMIC MOMENT ON GRAVITATIONAL ORIENTATION REGIME FOR SALYUT-6, SOYUZ COMPLEX Abstract Only **c18**

V. A. Sarychev and V. V. Sazonov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 130 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 63-83 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

Within the framework of a simple mechanical model a study was made of the motion of the Salyut-6 - Soyuz orbital complex relative to its center of mass in a uniaxial gravitational orientation regime. The satellite is assumed to be a solid body having the configuration of a cylinder to which are attached three plates, solar cells. The orbit of the satellite center of mass in absolute space is considered circular. The effect of gravitational and restoring aerodynamic moments on the satellite is taken into account. The satellite equations of motion allow the natural introduction of a small parameter: the ratio of the longitudinal moment of inertia to the transverse moment of inertia. The Krylov-Bogolyubov method is used in constructing formal two-parameter integral surfaces of these equations describing oscillations and rotations of the satellite about the longitudinal axis directed approximately along the local vertical. Such satellite motions can be regarded as nominal unperturbed motions in a gravitational orientation regime. A numerical investigation of these integral surfaces was carried out. The resonances between satellite motion about its longitudinal axis and oscillations of this axis relative to the local vertical considerably intensify the influence exerted on the satellite by the nonpotential component of the aerodynamic moment. Examples are given in which such intensification results in strong oscillation of the Satellite and disruption of the gravitational orientation regime. R.J.F.

N86-20237# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL OF PLANETARY ROVER MOVEMENT Abstract Only **c37**

Ye. I. Grigoryev and S. N. Yermakov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 130-131 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 92-99 Original language document was announced in IAA as A85-25334 (For primary document see N86-20178 10-88)

Avail: NTIS HC A03

A planet roving vehicle rolls down a landing ramp from the descent vehicle onto a planet surface. The motion of the planet rover during rollout is described mathematically, with the following assumptions. The rover consists of a absolutely solid frame, motor and wheels which have inertial mass and are coupled by individual torsional suspensions with longitudinal rocking of the support arms. Each wheel is elastically deformable in three mutually perpendicular directions at the point of contact. The elements of the disembarka-

tion platform ramp are absolutely rigid and the planet's soil is elasto-plastic. The analysis specifies the conditions for the contact of the wheels and the planet surface. The purely theoretical analysis provides equations for the kinetics of vehicle motion during rollout. Author

N86-20238# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL-GEOMORPHOLOGICAL INTERPRETATION OF PHOTO IMAGE PATTERNS IN SPACE PHOTOGRAPHS FOR WESTERN PART OF FERGANA VALLEY AND ITS MOUNTAINOUS FRAMEWORK Abstract Only c43
D. Magzumova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 135 Transl. into ENGLISH from Uzbekskiy Geologicheskiy Zhurnal (Tashkent, USSR), no. 4, Jul. - Aug. 1985 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A detailed analysis of photo image patterns was carried out using multizonal photographs at 1:1,000,000 obtained from the LANDSAT satellite in four spectral ranges in the western part of the Fergana valley and the mountains surrounding it. With respect to geomorphological analysis of the patterns, the most informative photographs were obtained in the spectral zone 0.8-1.1 microns. The territory was represented by three major geomorphological types: mountainous uplifts, made up primarily of Plaeozoic deposits; adyr (desert plains without sands but with soft ground); and foothills consisting of Neogene and Lower- and Middle Quaternary deposits. On the basis of the photo image pattern it is possible to differentiate strongly, moderately and weakly dissected, undulating and flat surfaces. Flat and slightly undulating surfaces are interpreted on the basis of a geometrical or spotty pattern of cultivated landscapes; moderately dissected surfaces are discriminated on the basis of a jetlike pattern; well-dissected surfaces are discriminated from patterns form by adyr relief forms. Comparison of the interpreted photographs with Meteor photographs at 1:2,500,00 indicated that the latter reflect the nature of surface macrodissection. Their patterns are caused by relief megaforms associated with large geological structures. These photographs, at a larger scale, corresponded to the largest geomorphological regions. The photographs at 1,000,000, on the other hand, reflected lower-order structures. R.J.F.

N86-20239# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF COLOR COORDINATES OF SOME SOILS ACCORDING TO AIRCRAFT MEASUREMENT DATA Abstract Only c43
K. Ya. Kondratyev, V. V. Kozoderov, P. P. Fedchenko, S. M. Somova, and L. B. Karvovskaya *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 137-138 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 29-40 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A method for measuring the humus content in agricultural soils is described. In this method an aircraft carries a spectrometer used in measuring the spectral brightness coefficients (SBC) in the visible wavelength region which are then used in computing color coordinates quantitatively characterizing the humus content. Then the quantity of humus in soils is computed using a preconstructed calibration curve. Three types of soils were involved in this study: soddy-podzolic, gray forest and chernozem, located in a number of oblasts. Observations were made along measurement lines situated approximately 50 km apart for which SBC measurements were made. The spectral reflection curves were used in computing the color coordinates and determining the humus content at the measurement points. Observations were made from an AN-2 aircraft from a mean altitude of 100 m; measurements were made at a solar altitude greater than 40 deg. Photometric measurements of all the investigatated soils were made twice (1973 and 1981). The analyzed data revealed that aircraft spectrophotometric measurements can be used successfully in studying the dynamics of soil humus content. However, the method is suitable only for chernozems and possibly gray forest soils. Author

N86-20240# Joint Publications Research Service, Arlington, Va.
EXPERIENCE IN MAPPING EARTH ON BASIS OF SPACE PHOTOINFORMATION Abstract Only c43
L. N. Kuleshov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 138 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 41-44 Original language document was announced in IAA as A85-37117 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The use of photographic images obtained in space to compile large scale (1:500,000) thematic maps of agricultural land in the Kalmyk territory of the USSR is evaluated. It is shown that the information content of space images may vary according to the type of map being compiled: for maps of the topographical features and uses of agricultural land, 70 percent of the data extracted from space images was useful; for maps of soil types, only 40 percent of the photographic information data was useful. I.H. (IAA)

N86-20241# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL INFORMATION CONTENT OF MULTIZONAL PHOTOGRAPHS Abstract Only c43
N. A. Yakovlev and S. G. Slutskaya *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 139 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 45-51 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

An evaluation is given for the several methods now in use for evaluating the geological information content of space photographs. Multizonal photographs must be evaluated primarily on the basis of the effectiveness of reflection of spectral criteria. In this method in discriminating the feature and identifying it the problem will be solved more successfully the greater the contrast between the images of the discriminated feature and the background (adjacent features). Contrast can be used as the principal index of comparative information content of mutizonal images obtained in different survey channels. Definite procedures are given for determining contrast. It is concluded that there are no universally informative survey channels for discriminating the images of geological features on the basis of spectral criteria. The geological formation content of multizonal photographs as a whole and each survey channel separately can be evaluated only from the point of view of a specific problem. R.J.F.

N86-20242# Joint Publications Research Service, Arlington, Va.
GEOLOGICAL INFORMATION CONTENT OF SPACE PHOTOGRAPHS OBTAINED IN DIFFERENT SPECTRAL RANGES IN COURSE OF GOBI-KHANGAI EXPERIMENT (MUSHUGAY-GURVANBOGD TEST RANGE) Abstract Only c43
V. I. Makarov and G. I. Volchkova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 140 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 52-58 Original language document was announced in IAA as A85-37118 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The Gobi-Khangai experiment was carried out from aboard the Salyut-6 Soyuz-39 orbital complex by a Soviet-Mongolian crew in April 1981. A multizonal space photographic survey of the Mushugay-Khuduk region was made. This area is situated in the north-central part of the Gobi, directly to the east of Gurvan-Bogd Range in the Gobi Altai. Included are the results obtained in an earlier (June 1973) survey of this same territory from the ERTS-1 satellite under different illumination conditions. The availability of data from two surveys made it possible to analyze photographic conditions more fully than would have been possible on the basis of the results of only one survey. The strengths and weaknesses of the two surveys are compared. The space photographs served as an excellent base for compiling a map of Quaternary deposits far exceeding the accuracy of maps compiled by surface methods. These photographs made possible a considerable upgrading of earlier published geological and tectonic maps. The comparative

analysis of the geological content of space photographs obtained in different spectral ranges indicated that for visual interpretation under conditions similar to the Gobi Altai it is sufficient to have images in the spectral range 0.8 to 0.9 microns the range 0.6 to 0.7 microns can be recommended as an additional range. A need for other ranges would arise only for obtaining synthesized images. Author

N86-20243# Joint Publications Research Service, Arlington, Va.
TECTONIC INTERPRETATION OF RESULTS OF INTERPRETATION OF SPACE PHOTOGRAPHS OF THE CAUCASUS Abstract Only c43
G. A. Mikheyev and M. G. Makarova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 141 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 59-66 (For primary document see N86-20178 10-88)
Avail: NTIS HC A09

An extensive literature has already been devoted to the possibilities of space photographs of the Caucasus for the geological study of that region. These materials and published results of such work are reviewed and integrated. A full-page map shows the location of lineaments and structures of the central (annular) type in the Caucasus region; this map is used in describing the interpreted photographs. It is concluded that in the formation of the present-day tectonic plan a definite role is played by faults of sublatitudinal and northwesterly directions forming disjunctive systems, longitudinal tectonic sutures bounding the principal structural-formation zones of the region. Dislocations with breaks in continuity but belonging to a single system were formed at the same time and under the same geotectonic conditions. Their degree of expression on space photographs in the form of systems of lineaments is determined by the degree of their influence on the formation of present-day morphostructures, that is, by activity in the neotectonic and most recent stages in development of this region. Structures of the central type in most cases constitute a surface reflection of vertical movements of polygonal basement blocks. But there are some structures of the central type whose nature remains unclarified. Space photograph analysis has shown that these materials are of great practical and scientific value for seismic research. R.J.F.

N86-20244# Joint Publications Research Service, Arlington, Va.
PRINCIPAL PATTERNS OF MORPHOTECTONIC STRUCTURE OF EASTERN CAUCASUS DETECTED BY REMOTE SENSING METHOD Abstract Only c43
B. A. Budagov, A. A. Mikailov, A. S. Aliyev, and E. K. Alizade *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 142 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 67-72 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

On space photographs, the Eastern Caucasus region in general is characterized by a quite nonuniform photoimage pattern attributable to sharp differences in the structure and strike of structural elements and a patchy composition of sedimentary strata. Against this background, interpretation of space photographs has made it possible to define major morphostructural zones, each having its own specific photoimage, pattern and phototone. Particular attention is devoted to the pattern of linear, arcuate and annular lineaments (a map of interpreted lineaments, accompanies the text). The overwhelming majority of lines fit into two conjugate systems of lineaments: orthogonal and diagonal. Lineaments of the orthogonal system with general Caucasian and anti-Caucasus directions show up on the space photographs more clearly and are characterized by a great extent. Longitudinal lineaments, constituting more than 60% of all the interpreted lines, are predominant. Lineaments of an anti-Caucasus strike are more difficult to interpret because they are less clearly expressed in the relief. The diagonal system includes lineaments of northeasterly and northwesterly strikes. The large lineaments for the most part coincide with faults detected by geological-geophysical methods. Many lineaments are not shown on existing tectonic maps and require field confirmation. Lineaments of each definite strike correspond to definte types of faults. The morphototectonic structure of the Eastern Caucasus as revealed by space photographs is entirely consistent with the theory of plate tectonics. R.J.F.

N86-20245# Joint Publications Research Service, Arlington, Va.
AUTOMATED SPECTRAL ANALYSIS OF DIMENSIONS AND DIRECTIONS OF STRUCTURAL ELEMENTS ON EARTH'S SURFACE Abstract Only c43
D. K. Tkhabisimov, D. A. Uiskov, and M. I. Kolsenik *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 143 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 3-80 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A method for a structural-zonal survey of the Earth's surface from space is proposed. In this method the surface is viewed through a moving window containing N X N resolution elements, which is called an operational unit. Some functionals, such as a matrix of integral relative energies in several zones of a Wiener spectrum (in a polar coordinate system), are computed for each operational unit. The Ziman method is used in determining the sizes of tree crowns and discriminating the predominant directions of lineaments on photographs of the Earth's surface. For each photograph fragment it is necessary to compute the functions C(m) and L(n) whose values correspond to the part of Wiener spectrum energy falling within annular and slit filters respectively. The analysis was made for models of a forest and lineament structures with a uniform distribution (with respect to positions and sizes), and also for real photographs. Maps of crown size were constructed by correlation analysis of Wiener spectra. The discriminated directions are determined by the local maxima of the L(n) function. A full algorithm is given for automated fragment-by-fragment spectral analysis of images. An analysis of models of images of structural elements is used in developing a method for retrieving the probability distribution function for tree crown sizes from the Fourier spectrum. Author

N86-20246# Joint Publications Research Service, Arlington, Va.
USE OF MATERIALS FROM LARGE-SCALE AERIAL PHOTOSURVEY OF FOREST IN AUTOMATED INTERPRETATION OF SPACE PHOTOGRAPHS Abstract Only c43
L. A. Kuzenkov, N. A. Aparinova, and A. V. Starchenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 143-144 Transl. into ENGLISH from Isledovaniye Zemli iz Kosmosa(Moscow, USSR), no. 2, Mar. - Apr. 1985 p 90-96 Original language document was announced in IAA as A85-37119 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A step-wise numerical technique to process large scale aerial survey data for forestry applications is described. The method is based on the SNIMOK-DANNYE computer system for processing photographic data obtained by satellite. A block diagram illustrating the step-wise processing procedure is given and the statistical correlation used to match forest features with suitable deciphering indicators is described. The technique has been used to process photographic data from 30 different aerial surveys of forest land in Iakutsk, USSR, and was found to be practical for widespread use. I.H. (IAA)

N86-20247# Joint Publications Research Service, Arlington, Va.
CHOICE OF CONDITIONS FOR AEROSPACE SURVEY IN VISIBLE SPECTRAL RANGE FOR DETERMINING ALBEDO OF OBJECT AND BACKGROUND Abstract Only c43
A. B. Karasev and S. V. Pantyukhov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 144-145 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 97-107 Original language document was announced in IAA as A85-37120 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The use of stereoscopic survey results to determine absolute

values for target and background reflectance in optical surveys is discussed. It is shown that precise values for the angle of the Sun, sighting angle, and the spectral interval may be selected when the arriving radiation is expressed as a function of background and target reflectance. The effect of the atmosphere on the signal magnitude is expressed by average values for atmospheric conditions. The statistical correlation of the intensity of incoming radiation with aerosol optical thickness is illustrated. I.H. (IAA)

N86-20248# Joint Publications Research Service, Arlington, Va.
SYSTEM OF CRITERIA FOR ANALYSIS AND RECOGNITION OF IMAGES OF RANDOM SPATIAL TEXTURES Abstract Only **c43**

O. V. Bazarskiy and Yu. V. Korzhik *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 145-146 Transl. into ENGLISH from Issledovaniya Zemli iz Kosmosa (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 108-110 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Data on surface texture obtained in the form of a set of information criteria, as a result of compression of videoinformation, can be used in the routine analysis of images aboard a flight vehicle and in reducing the flow of information to Earth which was registered during surveys with a high spatial resolution. The data transmitted to the Earth can be analyzed using known textural criteria computed from matrices of spatial distribution of the gray tone, ensuring an adequately high percentage of correct identification of images (up to 90%). However, this requires a great number of computation operations, proportional to the number of resolution elements in the image, and the need for technically complex computers. For this reason the authors have developed a system of criteria for the analysis and identification of the images of random spatial textures which can be used with a very simple computer. On the basis of a matrix of primary criteria P sub ij it is possible to form a system of L = 3(1+2M) criteria: A sub i, C sub i, D sub i. The choice of the number of threshold levels M is dependent on the statistical properties of the analyzed textural sectors on the surface. It is adequate that M = 2 for images for random textures having a normal law of distribution of optical densities. A total of L = 15 criteria are computed, which requires only 105 computation operations, which is several orders of magnitude less than in known systems of criteria. A block diagram of the method for the formation of criteria and an example of application of the method are given. R.J.F.

N86-20249# Joint Publications Research Service, Arlington, Va.
RATIONALIZATION OF SYSTEM FOR ACQUISITION OF OZONE REMOTE MEASUREMENT DATA IN NORTHERN HEMISPHERE Abstract Only **c43**

O. M. Pokrovskiy and A. K. Malygina *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 146 Transl. into ENGLISH from Issledovaniya Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 10-16 Original language document was announced in IAA as A85-29901 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Problems of resource economy are discussed for a remote-sensing observational system providing data on total ozone content in the Northern Hemisphere for further numerical analysis. Ozone field analysis is considered for polar, middle, and tropical latitudes, and for the whole hemisphere. It is shown that an optimization of the remote-sensing system makes it possible to achieve a resource economy of 30-70 percent depending on the situation. The presence of information links is observed in between UV measurements at high and middle latitudes. This makes it possible to avoid the duplication of information and to achieve a further resource economy. B.J. (IAA)

N86-20250# Joint Publications Research Service, Arlington, Va.
ANNUAL VARIATION OF CLOUD QUANTITY AND ALBEDO Abstract Only **c47**

O. Yu. Kyarner *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 147 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 17-22 Original language document was announced in IAA as A85-29902 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Data on annual variations of mean zonal cloud amount (CA) are compared with data on the albedo of the Earth-atmosphere system (EAS). An effort is made to evaluate the reliability of determining the cloud albedo effect on the basis of a comparison of cloud data with EAS albedo data obtained in satellite experiments. It is shown that available CA data yield qualitative agreement in annual variations only for the Northern Hemisphere. A comparison of the annual EAS albedo and CA in the tropical belt shows that the cloud albedo depends on the CA. It is concluded that, in order to determine the global cloud albedo effect, it is necessary to assess the joint distribution of the amount and thickness of clouds for large averaging scales. B.J. (IAA)

N86-20251# Joint Publications Research Service, Arlington, Va.
METHODS FOR STUDYING RECENT TECTONICS USING MATERIALS FROM REMOTE AND SURFACE DATA Abstract Only **c46**

A. A. Freydlin, Ye. G. Farrakhov, and L. F. Volchegurskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 147-148 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 32-38 Original language document was announced in IAA as A85-29904 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Methods for the complex study of tectonic formations to the east of the near-Caspian depression have been developed on the basis of the interpretation of space (Salyut-4) and aerial photographs in conjunction with other types of geological and geophysical data. This approach led to the determination of: (1) the location and structure of recent tectonic zones; (2) the correlation of interpreted elements relief and deep teconic characteristics of the region; (3) the connection between oil deposits and tectonic and neotectonic activity; and (4) the role of tectonic processes in the formation of dispersed-sand massifs in the eastern Caspian region. B.J. (IAA)

N86-20252# Joint Publications Research Service, Arlington, Va.
POSSIBILITIES OF USE OF REMOTE METHODS FOR INCREASING EFFICIENCY OF PETROLEUM AND GAS EXPLORATION WORK Abstract Only **c43**

M. Kh. Ishanov, V. A. Yushin, A. K. Gayazova, and G. N. Malashenkov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 148-149 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), n. 1, Jan. - Feb. 1985 p 39-46 Original language document was announced in IAA as A85-29905 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Space photoanomalies corresponding to structures promising for petroleum and gas are usually situated within the limits of anticlinal zones of petroleum and gas accumulation. Many buried anticlines in which petroleum and gas deposits have been discovered stand out as tonal photoanomalies in the near-IR spectral zone where the petroleum deposits show through as ovals of a darker tone, and gas deposits stand out in a lighter tone. Within the limits of the South Tajik Depression, for example, there are a number of discordant lineaments whose strike is not consistent with the most recent folding. Some of the most important features are sublatitudinal lineaments which can be identified with deep ancient faults which exert a great influence on the conditions for the formation and preservation petroleum and gas deposits. The combining of the results of traditional research methods and materials obtained by remote methods made it possible to define a number of promising regions which are recommended for further petroleum and gas exploration work. (These are clearly designated on the tectonic map). These promising regions are described in detail and some space photoanomalies within their limits are analyzed. R.J.F.

N86-20253# Joint Publications Research Service, Arlington, Va.
DETERMINING WATER SURFACES IN NORTHWESTERN BOHEMIA FROM SATELLITE DATA Abstract Only **c43**
K. Kirchner, J. Kolar, and S. Plachy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 149 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 47-51 Original language document was announced in IAA as A85-29906 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Satellite data were used in determining surface water formations in the territory of Czechslovakia. An analysis is given of a photograph of northwestern Bohemia which is characterized by a well-expressed dynamics of surface changes attributable to economic activity. The photograph was taken from the LANDSAT satellite on 30 June 1978. One of the manifestations of these changes is the appearance or disappearance of some water bodies in a relatively short time interval which necessitates corrections to topographic and geographic maps. A test range with an area of about 600 square kilometers was defined in the studied area. This is a mining region where open pits and mine tailings become filled or flooded with water. The water surfaces have different extents and configurations determined by the nature of the depression, hydrogeological and climatic conditions. The initial form of the information used in the study was the spectral characteristic of the water surface. The information used in the classification of water surfaces as from a single spectral channel for the near-IR region. A total of about 135,000 brightness values were obtained for the test range. Some 96 water surfaces of different extent were detected. These image data were compared with water surfaces on topographic maps at 1:25,000 and 1:50,000 and water surfaces on black-and-white panchromatic aerial photographs at 1:20,000. It was possible to make reliable identification of water bodies with an area greater than 1 hectare. R.J.F.

N86-20254# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE DESERTIFICATION MAPS AND METHODOLOGY FOR THEIR COMPILATION USING SPACE PHOTOGRAPHS Abstract Only **c43**
N. G. Kharin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 150 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 52-59 Original language document was announced in IAA as A85-29907 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Quantitative criteria of desertification are proposed, and a method for the compilation of desertification maps on the basis of space remote sensing data is developed. The desertification aspects include the current status, the rate and inherent risk of desertification, and the effect of animals and humans on the environment. LANDSAT and Soyuz-22 data on southest Turmenistan considered. B.J.(IAA)

N86-20255# Joint Publications Research Service, Arlington, Va.
USE OF SPACE METHODS FOR STUDYING SALINE SOILS AND SOLONCHAKS Abstract Only **c43**
E. A. Mamedov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 151 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 60-65 Original language document was announced in IAA as A85-29908 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

There is a spatial-temporal variability of saline lands which requires a constant inventory of their area and state and a systematic revision and correction of soil maps. A high percentage of the lands in the Azerbaijan SSR falls in this category. Work in the Adzhinourskaya steppe is described. Key sectors have been covered by detailed geobotanical surveys on the ground, taking into account the seasonal variability of the vegetation cover. After preparation of a detailed map of the key area on the basis of aerial photographs and ground field work, it was possible to proceed to interpretation and mapping on the basis of space photographs. The 1972 space photographs used were from the LANDSAT satellite in four spectral zones. It was found that the most effective spectral zones for the mapping of saline soils are 0.6 to 0.7 and 0.8 to 1.1 micrometers. The use of maps prepared from space photographs greatly increased the detail of the maps in comparison with those prepared by traditional methods, clearly revealing the natural pattern of soil and vegetation groupings, increasing the number of varieties of saline and swampy soils and solonchaks by a factor 2 to 3. The outlines of individual soil areas discriminated on the basis of phototone and color fully corresponded to the results of field mapping and data from physiochemical analysis. It was concluded that in Azerbaijan such work is best accomplished using multizonal photographs taken in July-August at wavelengths 0.5 to 0.6 and 0.6 to 0.7 micrometers. R.J.F.

N86-20256# Joint Publications Research Service, Arlington, Va.
DETERMINING SOIL MOISTURE CONTENT BY MICROWAVE RADIOMETRY METHOD USING A PRIORI INFORMATION Abstract Only **c43**
Ye. A. Reutov and A. M. Shutko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 152 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 73-87 Original language document was announced in IAA as A85-29910 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Theoretical and experimental studies of the microwave emission characteristics of nonuniformly wet soils were conducted. The dependence of spectral radio-brightness contrast on the parameters of the permittivity (moisture) profile is obtained. The emission characteristics of soils with different moisture profiles were measured by a microwave radiometer at wavelengths of 2.5, 18, and 30 cm. A method for determining moisture-profile parameters and total moisture content in soil at a depth of one meter is proposed which is based on the joint utilization of remote microwave radiometry data and a priori information about the water-physical properties of the soil. B.J. (IAA)

N86-20257# Joint Publications Research Service, Arlington, Va.
RADAR MAPPING OF MOISTURE CONTENT OF OPEN SOILS Abstract Only **c43**
N. N. Krupenio *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 152-153 Transl. into ENGLISH from Issledovaniya Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 88-93 Original language document was announced in IAA as A85-29911 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Airborne sidelooking radar with a 60-100 m resolution was used for the moisture mapping of open soils (i.e., without vegetation cover) in the 0-10 cm layer in the Stavropol'sk region of the USSR. The difference between the moisture value obtained by the remote radar measurements and that obtained by direct thermoweight measurements did not exceed 2 wt percent in the 9-30 percent moisture variation range. B.J. (IAA)

N86-20258# Joint Publications Research Service, Arlington, Va.
DISCRIMINATING HOMOGENEOUS REGIONS WITH INCOMPLETE BOUNDARIES ON IMAGE Abstract Only **c43**
A. A. Zlatopolskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 153-154 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 94-102 Original language document was announced in IAA as A5-29912 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

An image segmentation method according to identified parts of region boundaries is proposed in the framework of the interpretation of remote-sensing images. Results of a theoretical analysis of a structure generated by a distance transformation are presented, and an algorithm based on the structure is formulated. An example of the application of the algorithm to geological image analysis is examined. B.J. (IAA)

N86-20259# Joint Publications Research Service, Arlington, Va.
SEGMENTATION OF HALF-TONE AEROSPACE IMAGES BY LEVEL LINES METHOD Abstract Only c43
D. Ye. Minskiy and M. M. Feygin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 154 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 103-112 Original language document was announced in IAA as A85-29913 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The advantages and disadvantages of segmentation methods for half-tone multicontour images are examined. A mathematical model of a continuous scalar field is used to develop an edge detection method based on the comparative analysis of the boundary and the characteristic grey-scale function. The corresponding algorithm is described along with its implementation in a system for the preliminary interpretation of remote-sensing data for purposes of land-reclamation mapping. A segmentation of a photograph taken from Soyuz-22 is considered as an example.
B.J. (IAA)

N86-20260# Joint Publications Research Service, Arlington, Va.
USE OF A PRIORI EVALUATION OF CONDITIONS FOR OBSERVING EARTH'S SURFACE FROM SPACE FOR EFFECTIVE CHOICE OF TIME FOR EXECUTING SURVEY Abstract Only c43
N. V. Kapitonova and Ye. L. Lukashevich *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 155 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 113-117 Original language document was announced in IAA as A85-29914 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Adequate study has been made of the motion of space vehicles for studying the Earth's natural resources, such as the nominal parameters of their working orbits, but a weak link which remains is the uncertainty in choice of the initial orientation of the orbital plane relative to the direction to the Sun. This orientation is determined by the angle tau = alpha-omega, where alpha is the right ascension of the Sun on the initial date of the survey, omega is the longitude of the ascending node of the space vehicle orbit, unambiguously related to the illumination conditions for the Earth's surface along the flight trajectory. A method has been developed for determining a rational omega value which would make possible the most complete satisfaction of requirements on solar altitude in surveys of different regions, taking their meteorological and climatic characteristics into account. For this purpose the Earth's surface, which is to be photographed from a circular orbit from a satellite with a specific inclination, is broken down into regions with characteristic climatic conditions.
R.J.F.

N86-20261# Joint Publications Research Service, Arlington, Va.
AEROSPACE OBSERVATIONS OF ADVECTIVE-EDDY FORMATIONS IN CENTRAL BALTIC SEA Abstract Only c43
I. A. Bychkova, S. V. Viktorov, V. V. Vinogradov, V. N. Losinskiy, and Kh. Yu. Brosin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 156 Transl. into ENGLISH from Issledovaniye Zemli iz Kosmosa (Moscow, USSR), no. 1, Jan. - Feb. 1985 p 118-122 Original language document was announced in IAA as A85-29915 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Under definite conditions eddy movements occurring at different depths in the Baltic Sea can be manifested in the form of surface nonuniformities of the temperature field and brightness of the sea surface. These nonuniformities are registered by satellite instruments operating in the visible and IR ranges. Considering the role of the wind in dynamic processes in the Baltic, there is probably a high frequency of recurrence of formation of local advective-eddy fronts of synoptic scales in the surface layer. Study of such phenomena was the objective of the second USSR-GDR Complex Subsatellite Experiment. The research ship A. von Humboldt during the first half of June 1983 was in a hydrological test range in the central part of the sea, each day occupying 8 to 9 stations. Satellite information in the IR range was received simultaneously. The observations revealed that regardless of wind conditions a correlation between radiation temperatures obtained from both a satellite and aircraft and shipboard thermodynamic temperatures can be traced to a depth of 17 m. At a depth of 35 to 40 m the correlation coefficient becomes negative, corresponding to the formation of a countercurrent in the Ekman layer. Accordingly, sea surface temperature maps obtained in the Baltic Sea using satellite data can be used in tracking drift currents. The three-dimensional thermal structure in the test range for 7 June on the basis satellite and ship is discussed.
Author

N86-20262# Joint Publications Research Service, Arlington, Va.
FEATURES IN ALLOWANCE FOR ATMOSPHERIC INFLUENCE IN VERY LONG BASELINE RADIOINTERFEROMETRY Abstract Only c43
N. S. Zabolotnyy and G. A. Shanurov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 157 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 3-8 Original language document was announced in IAA as A85-19994 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Space methods are playing an ever-increasing role in the solution of geodetic problems; this includes the very long baseline radiointerferometry method. The instrumental errors are on the order of centimeters and this accuracy may soon be increased by an order of magnitude. The measurement accuracy will be limited by the influence of the atmosphere and conditions for the propagation of electromagnetic waves. This influence is manifested in a change in the velocity of propagation and phase shift. These two phenomena were examined because they exert an influence on the measurement results in the most promising space geodesy radio methods: very long base radiointerferometry and the Doppler method for observing artificial Earth satellites. In order to solve these problems the authors propose models for the effective determination of the refractive index. These models are proposed for evaluating the time delays and frequency shifts of signals in the troposphere and ionosphere for different radio wave propagation conditions; corresponding formulas are presented. It is shown that distortions from the influence of the atmosphere in the measured ranges, range differences and Doppler frequency are so great that they must be taken into account in any geodetic determinations. Varieties of a biexponential model of the atmosphere are proposed for determining the refractive index.
Author

N86-20263# Joint Publications Research Service, Arlington, Va.
DETERMINING GEOCENTRIC GRAVITATIONAL CONSTANT BY SPACE GEODESY METHODS Abstract Only c43
Yu. V. Plakhov and A. V. Paramzin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 157-158 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 46-53 Original language document was announced in IAA as A85-19995 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The paper examines the problem of determining the preliminary value of the correction to the accepted value of the geocentric gravitational constant on the basis of modified equations of the orbital method of space geodesy. It is shown that satellites in near-polar almost-circular orbits are most suitable for the solution of this problem.
B.J. (IAA)

N86-20264# Joint Publications Research Service, Arlington, Va.
DETERMINING ELEMENTS OF OUTER ORIENTATION OF AEROSPACE PHOTOGRAPHS IN REMOTE STUDY OF DYNAMIC PROCESSES AND PHENOMENA Abstract Only c43
V. B. Dubinovskiy and A. A. Morozov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 158-159 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 66-70 Original language document was announced in

IAA as A85-19998 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

A method is proposed for determining the elements of outer orientation of a new flight on the basis of photographs of an old survey for which the elements of outer orientation are known. In the proposed method, two photographs of an old survey whose elements of outer orientation are known are used together with a photograph from a new flight. By forming two stereopairs from a photography of the new flight and one of the photographs from the old flight it is possible to determine the angular elements of outer orientation of the new photograph, the direction angles and angles of inclination of the photographic bases, and then, by solution of direct intersection using data from a pair of old photographs and the angular elements of outer orientation of a photograph from the new flight. The use of the elements of outer orientation of photographs of the old survey as control data completely precludes the need for determining reference points. The use of this method for constructing photogrammetric networks when revising topographic maps, in comparison with existing photogrammetric procedures, ensures an increase in the accuracy in constructing such networks. This method increases accuracy in determining terrain point coordinates due to a more precise determination of the control data (the elements of outer orientation of photographs) using the results of highly precise measurements of the coordinates of a large number of photograph points in the stage of determination of the elements of outer orientation. R.J.F.

N86-20265# Joint Publications Research Service, Arlington, Va.
PREDICTING COORDINATE ERRORS OF PHOTOGRAPH POINTS Abstract Only **c43**
V. G. Yelyushkin and B. V. Pronin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 159 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Feodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 70-75 Original language document was announced in IAA as A85-19999 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The paper examines the problem of improving the processing accuracy of space remote-sensing radar photographs by coordinate-error prediction at arbitrary points according to error values at reference points. An analytical expression (instead of a preliminary determination) of the error correlation function is obtained, and the parameters of this expression are chosen in such a way as to minimize the prediction error by comparing predicted and known error values in a certain part of the reference points. The proposed method makes possible a 30 percent improvement in processing accuracy. B.J. (IAA)

N86-20266# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF CARRIER ORIENTATION ERRORS ON IMAGE MOTION IN PHOTOGRAPHY FROM MOVING OBJECT Abstract Only **c43**
B. M. Miller and G. I. Fedchenko *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 160 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Geodeziya i Aerofotosyemka (Moscow, USSR), no. 5, Sep. - Oct. 1984 p 75-80 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Image motion frequently plays a decisive role in photography from moving objects because it results in image degradation. One of the causative factors is the influence of errors in the orientation system, a subject about which little has been published. D. A. Kawachi (Photogrammetric Engineering, Vol. 31, 1965) derived expressions for image motion rates caused by rotations of a vehicle with constant angular velocities with zero errors in orientation angles, but no expressions were derived for the additional rates caused by deviation of the vehicle coordinate system from a nominal position. Accordingly, the authors obtained evaluations of the influence of this type of error on image motion for any optical system. This basis for this work was the expressions for image motion obtained by B. M. Miller, et al. in Izv. VUZov: Geodeziya I Aerofotos'yemka, No. 4, 1984. The proposed method is based on numerical methods and use of an electronic computer, which makes it possible to evaluate the stochastic characteristics of image motion over the entire frame field. The algorithm proposed in the 1984 article can also be used in evaluating the influence of errors in the orientation and stabilization system. This problem has now been rectified and the algorithm is based on the assumption of smallness of the errors. The method is based on a determination of the partial derivatives for the image motion rate field. The algorithm for determining influence coefficients is used jointly with the algorithm for computing the residual rates of image motion, thereby reducing computer time in the stochastic modeling of system operation. Author

N86-20267# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF USING SATELLITE IR-INFORMATION FOR OCEANOLOGICAL RESEARCH Abstract Only **c48**
I. V. Likhachev and A. N. Michurin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 160-161 Transl. into ENGLISH from Vestnik Leningradskogo Universiteta: Geologiya, Geografiya (Leningrad, USSR), no. 14, issue 2, Jun. 1985 p 93-95 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Although there are real possibilities for obtaining satellite information (SI) for considerable expanses of the ocean, there are still no possibilities for its routine processing. This dictates a need for storing SI for its subsequent processing at on-shore computation centers. In exploring this problem, a Kapsi receiving station was used in determining the possibility of reception and registry of SI on an intermediate magnetic carrier with subsequent input of the SI into a computer. It was found that an ordinary magnetic recorder tape can be used as a magnetic carrier. An effective method was developed for SI registry on magnetic tape. On one track of an ordinary stereophonic recorder having adequately high frequency characteristics and relatively low detonation, there is registry of a satellite signal of a subcarrier frequency from the receiver output; the second track is used in registering a pulsed signal from a highly stable quartz oscillator used in data processing as a synchronizable signal determining the discreteness of SI digital readings. The next stage in data preparation is the input of satellite data registered on magnetic tape into a computer memory, with discrimination of R-radiometer data from the total volume of data. R.J.F.

N86-20268# Joint Publications Research Service, Arlington, Va.
DYNAMIC AEROSPACE SENSING (CONTENT, PROBLEMS, FIELD OF APPLICABILITY) Abstract Only **c43**
Yu. F. Knizhnikov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 161-162 Transl. into ENGLISH form Vestnik Moskovskogo Universiteta, Seriya 5: Geografiya (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 7-13 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Dynamic aerospace sensing is defined as a modern methodology for studying temporal dynamics with the use of aerospace methods. Direct and indirect variants are distinguished, being based on use of a series of photographs taken at different times or on use of individual photographs. Direct methods for the most part supply quantitative information on dynamics, its intensity and rate. The spatial and temporal coverage of the phenomena which can be studied using photographs taken at different times is different. Whereas there are virtually no spatial limitations, the duration of the temporal coverage does not exceed the 11 year, or possibly the bruckner cycle of natural changes. The indirect methods make it possible to study the temporal and spatial dynamics in a case when it is reflected in the external appearance of objects which are indicators of dynamics. The interval of temporal analysis is virtually unlimited. The range of features, phenomena and processes whose dynamics can be studied by aerospace methods is extremely broad and the range of scales is from detailed to global. Nevertheless, they are all based on common methodological principles ensuring a comparability of the results. In the different geographic branches, the level and breadth of development of such studies varies at present. They are particularly promising in meteorology, oceanology, glaciology and hydrology, which deal

with mobile objects and phenomena. However, the other geographical sciences, especially dealing with the socioeconomic aspects of geography, can profit greatly from application of the method. Another highly important merit of the method is that it can be applied in the prediction of spatial-temporal changes of features, phenomena and processes; it is useful in expert evaluations, extrapolation and modeling. Author

N86-20269# Joint Publications Research Service, Arlington, Va.
PRINCIPAL PHOTOGRAMMETRIC DEPENDENCES IN PROCESSING OF RADAR SURVEY MATERIALS Abstract Only **c43**
Yu. S. Tyuflin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 162 Transl. into ENGLISH from Geodeziya i Kartografiya (Moscow, USSR), no. 9, Sep. 1984 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

In the photogrammetric processing of the materials from radar mapping of the Venusian surface from the Venera-15 and Venera-16, which carried side-looking radars, it is necessary to have mathematical expressions for accomplishing a coordinate referencing of the radar survey materials, for constructing a control network on the planet, for compiling photomaps of its surface and other procedures. This is dictated by the fact that the geometrical principles involved differ from those applicable to photographic and TV images. In the case of radar images it is essential to determine the spatial position of each projecting ray; a radar image can be formed only after spatial determination of the position of the radar rays at the current moments in time. The full derivation of the required expressions is given. These are derived using a feature-centered orbital coordinate system with its origin at the center of mass of the station, which virtually coincides with the center of radiation of the on-board radar antenna. The use of one or another of these expressions is governed by the method for the formation of the radar images during their processing. In executing the correct photogrammetric processing of survey materials, the principal requirement in the formation of panoramas from each survey revolution is the possibility of obtaining primary radar information from it. For each terrain point appearing on the radar panorama, such information will be the range r from the station to the terrain point, the velocity component V sub r along this direction, and also the moments in time t of station position in a survey revolution orbit corresponding to these parameters. Author

N86-20270# Joint Publications Research Service, Arlington, Va.
MAPPING OF VEGETATION RESOURCES OF ARID ZONES USING SPACE PHOTOINFORMATION Abstract Only **c43**
V. S. Khrutskiy Transl. into ENGLISH from Geodeziya i Kartografiya (Moscow, USSR), no. 9, Sep. 1984 p 51-56 Original language document was announced in IAA as A85-14322 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The use of satellite remote-sensing techniques for the vegetation mapping of arid areas is examined, and the possibilities of the direct and indirect interpretation of vegetation cover using local landscape indicators are evaluated. Particular consideration is given to relief interpretation, the interpretation of rocks and friable deposits, and the interpretation and classification of vegetation. Finally, the characteristics of field and laboratory work pertaining to the generation of pasture maps are examined. L.M. (IAA)

N86-20271# Joint Publications Research Service, Arlington, Va.
NEW SPACE ADMINISTRATION GLAVKOSMOS USSR CREATED **c81**
In its USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 164-165 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 13 Oct. 1985 p 3 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

The Main adiminstration for Creation and Use of Space Technology for the National Economy and Scientific Research (Glaukosmos USSR) is discussed. Glavkosmos USSR will cooperate closely with all interested ministries and departments of the country. It will examined their proposals for study and exploration of space, development and will organize the corresponding work. Preparations and launches of space apparatus will be provided for as well as reception and dissemination of space information for practical use. R.J.F.

N86-20272# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES **c12**
In its USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 169-171 Repr. from TASS (Moscow, USSR) (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

Launch dates for Cosmos, Moliniy, and Raduga satellites are given in tabular form. Apogee, perigee, period, and inclination are listed. Instruments aboard each flight are noted. R.J.F.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N86-20273 New South Wales Univ., Sydney (Australia). School of Electrical Engineering and Computer Sciences.
SINGLE STRUCTURE, STEERABLE SYNTHESIS TELESCOPES UTILIZING OFFSET REFLECTORS Ph.D. Thesis Abstract Only
Nicholas Fourikis Sep. 1984 3 p
Avail: Issuing Activity

The limit resolution at millimeter wavelengths and atmospheric attenuation increase total mapping time of extended regions of the sky to an unacceptable level for single beam radio telescopes. Conversion of a single beam telescope operating near its limiting resolution to a multiple beam telescope capable of taking high resolution and high sensitivity maps would decrease total mapping time to a reasonable level. The annular synthesis telescope with a fully steerable structure can be used to minimize astigmatism and exhibits considerable immunity to noise induced by the troposphere. When dual offset reflectors are used, the geometric optics cross polarization is negligible in the absence of misalignment errors. A model annular synthesis telescope operating at 38 GHz was designed and built. Measurements taken agree with theoretical results. B.G.

N86-20274*# Pennsylvania State Univ., University Park. Dept. of Astronomy.
OPTICAL AND UV SPECTROSCOPY OF THE PECULIAR RS CVn SYSTEM, RT LACERTAE
David P. Huenemoerder and Samuel C. Barden (Kitt Peak National Observatory, Tucson, Ariz.) 9 Nov. 1985 28 p refs
(Grants NAG5-405; NSF AST-83-17867)
(NASA-CR-176525; NAS 1.26:176525) Avail: NTIS HC A03/MF A01 CSCL 03A

Spectra in the H-alpha and H-beta regions of the peculiar double-lined RS CVn binary, RT Lacertae, were obtained in the fall of 1984. Limited International Ultraviolet Explorer (IUE) long wavelength low and high resolution spectra were obtained concurrently. The ground based spectra have shown an asymmetry with orbital phase in the H-alpha profile. The H-beta profiles were consistent with the same effect. One hemisphere showed excess emission and the other excess absorption, with a broad Gaussian emission component superposed upon the excess H-alpha line. An improved radial velocity curve, giving a better determined mass ratio and geometry was derived. This combined with the radii implied by the rotational broadening of the spectra, showed one component to be 80 to 90% filling the equilibrium Roche surface. The two-faced nature is, therfore, very likely due to mass transfer from the contact component impacting upon its companion. Low resolution ultraviolet data showed that the supposed cooler component is bluer than its companion. High resolution ultraviolet data taken during secondary eclipse showed Mg II emission strength which decreased more slowly than the area visible. The phase behavior of the low

resolution data support the former situation, indicating traditional chromospheric activity. E.A.K.

N86-20275# Los Alamos National Lab., N. Mex.
HIGH SPEED PHOTOMETRY OF AN UMa
J. N. Imamura, T. Y. Steiman-Cameron, and R. H. Durisen 24 Jun. 1985 11 p Presented at the 9th North American Workshop On Cataclysmic Variable, Seattle, Wash., 24 Jun. 1985 Prepared in cooperation with Mount Wilson Observatory, Pasadena, Calif. and Indiana Univ., Bloomington
(Contract W-7405-eng-36)
(DE85-015715; LA-UR-85-2447; CONF-8506143-3) Avail: NTIS HC A02/MF A01

As a class, the AM Her objects exhibit temporal variability on time scales ranging from seconds to years. Most of the variations can be adequately described by shot noise models (Cordova and Mason 1982). Exceptions to this are the strictly periodic features modulated on the orbital periods of the systems (typically several hours) and the one to two second features which show up as excesses of power in the time averaged power spectra of AN UMa. It has been suggested that the short time scale features are due to an oscillatory instability of radiative accretion shocks discovered by Langer, Chanmugam, and Shaviv (1981, 1982). A direct physical relationship between the one to two second optical variations and shock oscillations has not yet been demonstrated. Because of the potential importance of such a result further study of these systems is clearly warranted. In this work, we examine the short time scale behavior of AN UMa in more detail and improve on the work of Middleditch (1982) by resolving the feature in time. DOE

N86-20187# Joint Publications Research Service, Arlington, Va.
USE OF LIQUID MIRRORS IN ASTRONOMY Abstract Only
V. P. Vasilyev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 84 Transl. into ENGLISH from Astronomicheskiy Zhurnal (Moscow, USSR), v. 62, no. 3, May - Jun. 1985 p 598-601 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20191# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SURFACE STRUCTURE OF CELESTIAL BODIES WITHOUT ATMOSPHERES ON POLARIZATION CHARACTERISTICS OF REFLECTED LIGHT Abstract Only
L. O. Kolokolova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 86 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 2, Apr. - Jun. 1985 p 165-173 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20214# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF NONPOLAR LATITUDE VARIATIONS Abstract Only
A. A. Korsun *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 105 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 1, Jan. 1985 p 78-80 Original language document was announced in IAA as A85-48687 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20295*# Washington Univ., Seattle.
MULTIFREQUENCY OBSERVATIONS OF DWARF NOVAE OUTBURSTS
Paula Szkody *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 39-45 refs Sponsored by ESA (For primary document see N86-20287 10-93)
(Grants NSG5-395; NSF AST-84-05923)
Avail: NTIS HC A14/MF A01 CSCL 03B

N86-20296# Cambridge Univ. (England). Inst. of Astronomy.
ECLIPSE STUDIES OF DWARF NOVAE
Keith Horne *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 47-53 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20297# Tasmania Univ., Hobart (Australia). Dept. of Physics.
SPECTROPHOTOMETRY OF THE ECLIPSING DWARF NOVAE V2051 OPHIUCHI
D. J. Watts, J. Bailey (Anglo-Australian Observatory, Sydney, Australia), P. W. Hill (St. Andrews Univ., Scotland), and J. G. Greenhill *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 55-59 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20298# Oxford Univ. (England). Dept. of Astrophysics.
THE THEORY AND OBSERVATION OF SUPERHUMPS IN SU UMA SYSTEMS
P. A. Charles, C. J. Clarke, G. T. Bath, R. Whitehurst, and J. Bailey (Anglo-Australian Observatory, Sydney, Australia) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 61-65 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20305# Nicolaus Copernicus Univ., Torun (Poland). Inst. of Astronomy.
THE H-BETA AND H-GAMMA PROFILES IN CH CYGNI DURING THE RECENT DROP OF BRIGHTNESS
M. Mikolaejewski and R. Biernikowicz *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 105-108 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20309# European Space Agency. European Space Operations Center, Darmstadt (West Germany). EXOSAT Observatory.
THE SPECTRAL AND TEMPORAL VARIABILITY OF GX 13+1
L. Stella, N. E. White, and B. G. Taylor (ESA/ESTEC, Noordwijk, Netherlands) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 125-128 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20320# Indian Inst. of Astrophysics, Bangalore.
SPECTROPHOTOMETRY OF NOVA VULPECULAE 1984-1
B. S. Shylaja *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 183-185 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20323# Observatoire de Paris-Meudon (France). Dept. d'Astrophysique Fondamentale.
BUGS IN THE METHODS FOR DETERMINING THE EFFECTIVE TEMPERATURES OF IONIZING STARS IN SYMBIOTICS AND NOVAE
R. Tylenda and G. Stasinska *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 197-199 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20331# Erlangen-Nuremberg Univ. (West Germany). Inst. of Astronomy.
CONTINUUM AND LINE PROFILE VARIATIONS OF THE NOVA-LIKE SYSTEM V3885 SGR
K. Haug and H. Drechsel *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 233-236 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20332# Osservatorio Astrofisico, Asiago (Italy).
ULTRAVIOLET AND OPTICAL OBSERVATIONS OF THE INTERMEDIATE POLAR 3A 0729+103
R. Falomo, P. A. Charles (Oxford Univ., England), R. Corbet (Oxford Univ., England), L. Maraschi (Milan Univ., Italy), G. Tagliaferri (Milan Univ., Italy), E. G. Tanzi (CNR, Milan, Italy), and A. Treves (Milan Univ., Italy) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 239-243 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20333# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
FIVE-COLOR POLARIMETRY OF AM HERCULIS
V. Piirola, O. Vilhu, J. Kyroelaeinen, N. Shakhovskoi (Crimean Astrophysical Lab., USSR), and Y. Fimov (Crimean Astrophysical Lab., USSR) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 245-249 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20336# Tuebingen Univ. (West Germany). Inst. fuer Astronomie.
SPECTRAL AND INFRARED DIFFERENCES BETWEEN NOVA-LINKS AND DWARF NOVAE
D. J. Watts *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 259-262 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20338# Ceskoslovenska Akademie Ved, Ondrejov. Inst. of Astronomy.
VERY LONG-TERM PHOTOMETRY OF HZ HER=HER X-1 AND V1727 CYG=4U2127+47: ACTIVE AND INACTIVE STATES
R. Hudec, W. Wenzel (Academy of Sciences, Sonneberg, East Germany), W. Goetz (Academy of Sciences, Sonneberg, East Germany), G. Richter (Academy of Sciences, Sonneberg, East Germany), H. Huth (Academy of Sciences, Sonneberg, East Germany), and J. Drbohlav (Rtyne Observatory, Poland) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 267-271 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N86-20276 Rochester Univ., N. Y.
POLARIZATION AND INFRARED IMAGING OF REGIONS OF STAR FORMATION Ph.D. Thesis
Andrea Moneti 1985 236 p
Avail: Univ. Microfilms Order No. DA8511908

Observational studies of two regions of star formation are presented for the Taurus cloud and the BN-KL region of Orion. The magnetic field structure in the Taurus cloud was studied in order to investigate its possible role in the evolution of the cloud. It was found that the magnetic field is generally perpendicular to the elongated structures that make up the cloud, and that observed structure could be due to the effects of the magnetic field during the early stages of collapse. In addition, the magnetic field may have presented the formation of massive stars by inhibiting the collapse of large cores, while not effecting the collapse of the small ones. Using a new near-infrared array camera, high resolution (1') images of several young stars embedded in the cloud were also obtained. Most of these sources have extended, spatially resolved circumstellar shells. The largest shell was found around L1551-IRS5; that shell is flattened along the direction of the magnetic field which is also the direction of the bipolar flow of molecular gas that is associated with with star. It is suggested that the observed shell is responsible for collimating the outflow.
Author

N86-20277*# California Univ., Santa Barbara. Dept. of Geological Sciences.
MAGNETISM OF NAKHLITES AND CHASSIGNITES Final Technical Report, 1 Mar. 1984 - 28 Feb. 1985
Stanley M. Cisowski 10 Feb. 1985 27 p refs
(Grant NAG9-72)
(NASA-CR-176518; NAS 1.26:176518) Avail: NTIS HC A03/MF A01 CSCL 03B

Hysteresis measurements on three shergottite and two nakhlite meteorites indicate single domain grain size behavior for the highly shocked Shergotty, Zagami, and EETA 79001 meteorites, with more multidomain-like behavior for the unshocked Nakhla and Governador Valadares meteorites. High viscosity and initial susceptibility for Antarctic shergottite ALHA 7705 indicate the presence of superparamagnetic grains in this specimen. Thermomagnetic analysis indicate Shergotty and Zagami as the least initially oxidized, while EETA 79001 appears to be the most oxidized. Cooling of the meteorite samples from high temperature in air results in a substantial increase in magnetization due to the production of magnetite through oxidation exsolution of titanomagnetite. However, vacuum heating substantially suppresses this process, and in the case of EETA 79001 and Nakhla, results in a rehomogenization of the titanomagnetite grains. Remanence measurements on several subsamples of Shergotty and Zagami meteorites reveal a large variation in intensity that does not seem related to the abundance of remanence carriers. The other meteorites carry only weak remanence, suggesting weak magnetizing fields as the source of their magnetic signal. The meteorites' weak field environment is consistent with Martian or asteroidal body origin but inconsistent with terrestrial origin. E.A.K.

N86-20278*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
COMETARY ATMOSPHERES: MODELING THE SPATIAL DISTRIBUTION OF OBSERVED NEUTRAL RADICALS Interim Report, Sep. - Nov. 1985
Michael R. Combi Jan. 1986 53 p refs
(Contract NASw-3950)
(NASA-CR-176548; NAS 1.26:176548) Avail: NTIS HC A04/MF A01 CSCL 03B

New data for the spatial distribution of cometary C2 are presented. A recompilation of the Haser scale lengths for C2 and CN resolves the previously held anomalous drop of the C2/CN ratio for heliocentric distances larger than 1 AU. Clues to the source of cometary C2 have been found through fitting the sunward-antisunward brightness profiles with the Monte Carlo particle-trajectory model. A source (parent) lifetime of 3.1 x 10,000 seconds is found, and an ejection speed for C2 radicals upon dissociation of the parent(s) of approx. 0.5 km 1/5 is calculated. E.A.K.

N86-20279# Los Alamos National Lab., N. Mex.
TIME DEPENDENT WHITE DWARF RADIATIVE SHOCKS
J. N. Imamura, M. T. Wolff, and R. H. Durisen 1985 9 p refs Presented at the 9th North American Workshop on Cataclysmic Variables, Seattle, Wash., 24 Jun. 1985 Prepared in cooperation with Naval Research Lab., Wash., D.C. and Indiana Univ., Bloomington
(Contract W-7405-eng-36)
(DE85-015698; LA-UR-85-2538; CONF-8506143-2) Avail: NTIS HC A02/MF A01

We study the oscillatory instability of white dwarf radiative accretion shocks discovered by Langer, Chanmugam, and Shaviv. We extend previous works by examining spherical shocks dominated by: (1) bremsstrahlung and Compton cooling; and (2) bremsstrahlung and Compton cooling with the effects of electron thermal conduction are not negligible. The results of our calculations allow us to delineate stability regimes as a function of the dwarf mass, M/sub d, and the accretion rate, M(0). We parameterize M(0) in terms of the optical depth to electron scattering through the preshock flow, tau sub es. In the Compton cooling and bremsstrahlung case, the shocks are unstable to low order oscillation modes if M/sub d less than or equal to (0.7 + or - 0.1) M/sub solar/ for tau/sub es/ = 14, and if M/sub d less than or equal to (0.9 + or - 0.1) M/sub solar for tau/sub es/ = 1. When electron thermal conduction is added, low order oscillation modes are unstable only if M/sub d less than or equal to (0.3 + or - 0.1) M/sub sun mass. The unstable modes have approximate oscillation periods of 1.1 tau/sub br and 0.63 tau/sub br, where tau/sub br is the bremsstrahlung cooling time scale of the postshock plasma. DOE

N86-20280# Tel-Aviv Univ. (Israel).
WORLD SPINORS IN RIEMANNIAN GRAVITY
Y. Neeman 1985 21 p refs Presented at the Fibre Bundle Workshop, Beersheba, Israel, 31 Dec. 1984
(Contract DE-FG05-85ER-40200)
(DE86-001660; DOE/ER-40200/014; CPT-85-016; CONF-841285-1) Avail: NTIS HC A02/MF A01

We introduce a pseudo-frame serving to transform an anholonomic infinite spinor representation of S-bar L-bar(4, vertical bar R) carrying the Lorentz group generators into a holonomic S-bar L-bar (4, vertical bar R) representation carrying a realization of the diffeomorphism group. DOE

N86-20190# Joint Publications Research Service, Arlington, Va.
COMETARY ICE HALO AND TEMPERATURE OF INNER COMA Abstract Only
D. V. Bisikalo and V. S. Strelnitskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 86 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 6, Jun. 1985 p 475-480 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20194# Joint Publications Research Service, Arlington, Va.
MEAN DENSITY OF METEOR STREAM INCIDENT ON EARTH Abstract Only
P. B. Babadzhanov, R. Sh. Bibarsov, V. S. Getman, and V. M. Kolmakov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 89-90 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 4, Oct. 1985 p 824-826 Original language document was announced in IAA as A86-14580 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20288# Cape Town Univ. (South Africa). Dept. of Astronomy.
NOVA REMNANTS
Brian Warner *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 1-6 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20289# Academy of Sciences (USSR), Moscow. Astronomical Council.
EVOLUTION OF LOW MASS CLOSE BINARIES WITH ORBITAL MOMENTUM LOSSES
A. V. Tutukov and L. R. Yungelson *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 7-16 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20290# Ludwig-Maximilians-Universitaet, Munich (West Germany). Universitaets-Sternwarte.
THE MASS SPECTRUM OF THE WHITE DWARFS IN CATACLYSMIC BINARIES
H. Ritter and A. Burkert *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 17-20 refs (For primary document see N86-20287 10-93)
(Grant DFG-Ku-474/8-1)
Avail: NTIS HC A14/MF A01

N86-20291*# Arizona State Univ., Tempe. Dept. of Physics.
ON THE LONG TERM EVOLUTION OF WHITE DWARFS IN CATACLYSMIC VARIABLES AND THEIR RECURRENCE TIMES
E. M. Sion and S. G. Starrfield *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 21-23 refs (For primary document see N86-20287 10-93)
(Grants NAG5-343; NSF AST-81-171777; NSF AST-83-14788)
Avail: NTIS HC A14/MF A01 CSCL 03B

N86-20292# Technion - Israel Inst. of Engineering, Haifa. Dept. of Physics.
ON ACCRETION OF ANGULAR MOMENTUM FROM AN INHOMOGENEOUS MEDIUM
M. Livio, N. Soker, M. deKool (Amsterdam Univ., Netherlands), and G. J. Savonije (Amsterdam Univ., Netherlands) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 25-27 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20293# Barcelona Univ. (Spain). Dept. de Fisica de la Tierra y del Cosmos.
THE COLLAPSE OF WHITE DWARFS: A POSSIBLE ORIGIN OF LOW-MASS X-RAY BINARIES
J. Labay, R. Canal (Inst. d'Estudis Catalans, Spain), E. GarciaBerro, M. Hernanz (Inst. d'Estudis Catalans, Spain), and J. Isern *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 29-32 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20294# Slovak Academy of Sciences, Tatranska Lomnica (Czechoslovakia). Inst. of Astronomy.
LONGTERM EVOLUTION OF OUTBURST ACTIVITY IN CATACLYSMIC VARIABLE STARS
Z. Urban *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 33-36 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20299# Ludwig-Maximilians-Universitaet, Munich (West Germany). Universitaets-Sternwarte.
THE SPECTRAL ENERGY DISTRIBUTION OF STATIONARY ACCRETION DISKS IN CATACLYSMIC VARIABLES
A. Burkert and G. Hensler *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 67-71 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20301# Osservatorio Astrofisico, Asiago (Italy).
PROBABLE ORBITAL PERIOD FOR THE OLD NOVA CP PUP (1942) BELOW THE CATACLYSMIC BINARY PERIOD GAP
A. Bianchini, M. Friedjung (Inst. d'Astrophysique, Paris, France), and F. Sabbadin *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 77-79 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20302# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Dept. fuer Astrophysik.
ACCRETION DISK INSTABILITIES
Friedrich Meyer *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 83-89 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20303# Crimean Astrophysical Observatory (USSR).
SYMBIOTIC STARS
A. A. Boyarchuk *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 97-100 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20304# Nicolaus Copernicus Univ., Torun (Poland). Inst. of Astronomy.
ON THE NATURE OF CI CYGNI
J. Mikolaejewska *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 101-104 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20306# Tel-Aviv Univ. (Israel). Wise Observatory.
THE AG DRA: A CASE OF A STELLAR WIND ACCRETOR
E. M. Leibowitz, L. Formiggini, and H. Netzer *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 109-112 refs Sponsored by Israel Academy of Sciences (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20307# Academy of Sciences (USSR), Moscow. Astronomical Council.
THE SYMBIOTIC NOVA PU VUL
B. M. Shustov and A. V. Tutukov *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 113-115 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

N86-20310# Leicester Univ. (England). Dept. of Astronomy.
ACCRETION PROCESSES IN THE MAGNETIC CATACLYSMIC VARIABLES
A. R. King *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 133-138 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N86-20281*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OBSERVATIONS OF URANUS' SATELLITES: BIBLIOGRAPHY AND LITERATURE SEARCH
Robert A. Jacobson 15 Oct. 1985 19 p
(Contract NAS7-918)
(NASA-CR-176538; JPL-Pub-85-79; NAS 1.26:176538) Avail: NTIS HC A02/MF A01 CSCL 03B

A literature search has yielded more than 10,000 observations of the satellites of Uranus made from 1787 to 1985. The type (photographic, micrometer) and the number of observations are tabulated in 5 year increments and a complete bibliography is provided. Author

N86-20206# Joint Publications Research Service, Arlington, Va.
INTERPLANETARY DISTURBANCE FROM FLARE TRIPLET IN MAY 1981 AS OBSERVED BY PROGNOZ-8 Abstract Only
G. N. Sastenker, N. L. Borodkova, K. G. Ivanov, and N. V. Mikerina *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 99 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 134-142 Original language document was announced in IAA as A85-28496 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20224# Joint Publications Research Service, Arlington, Va.
VENUSIAN INFRARED RADIATION: APPROXIMATE METHODS FOR COMPUTING SPECTRUM IN ABSORPTION BANDS OF ATMOSPHERIC GASES Abstract Only
V. I. Moroz and L. V. Zasova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 119-120 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 259-267 Original language document was announced in IAA as A85-35240 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20225# Joint Publications Research Service, Arlington, Va.
VENUSIAN IMPACT CRATERS ON RADAR IMAGES OF VENERA-15 AND VENERA-16 SPACECRAFT Abstract Only
A. T. Bazilevskiy, B. A. Ivanov, V. P. Kryuchkov, R. O. Kuzmin, A. A. Pronin, and I. M. Chernaya *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 120-121 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 671-674 Original language document was announced in IAA as A85-39150 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20226# Joint Publications Research Service, Arlington, Va.
VENUSIAN EXOGENOUS PROCESSES AND SURFACE ROUGHNESS DETERMINED FROM RADAR OBSERVATIONS Abstract Only
V. P. Kryuchkov and A. A. Pronin *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 121 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 268-275 Original language document was announced in IAA as A85-35241 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20227# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF ERRORS IN RESULTS OF RADIO PROBING OF DAYTIME VENUSIAN IONOSPHERE CAUSED BY ITS ASPHERICITY Abstract Only
A. L. Gavrik and L. N. Samoznayev *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 122 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 148-157 Original language document was announced in IAA as A85-28497 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20228# Joint Publications Research Service, Arlington, Va.
PRINCIPAL TYPES OF STRUCTURES IN VENUSIAN NORTHERN HEMISPHERE Abstract Only
V. L. Barsukov, A. T. Bazilevskiy, R. O. Kuzmin, M. S. Markov, V. P. Kryuchkov, O. V. Nikolayeva, A. A. Pronin, A. L. Sukhanov, I. M. Chernaya, G. A. Burba et al *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 122-123 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 1, Jan. - Mar. 1985 p 3-14 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20229# Joint Publications Research Service, Arlington, Va.
RADIATIVE HEAT TRANSFER AND WATER CONTENT IN VENUSIAN ATMOSPHERE Abstract Only
M. Ya. Marov, A. P. Galtsev, and V. P. Shari *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 123-124 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 1, Jan. - Mar. 1985 p 15-41 Original language document was announced in IAA as A86-11963 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20230# Joint Publications Research Service, Arlington, Va.
MODEL OF COMPOSITION OF MARTIAN IONOSPHERE IN PHOTOCHEMICAL EQUILIBRIUM REGION Abstract Only
A. V. Pavlov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 124 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 276-282 Original language document was announced in IAA as A85-35242 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20231# Joint Publications Research Service, Arlington, Va.
COMPARATIVE ANALYSIS OF VOLCANIC EFFECT ON CLIMATE OF EARTH AND MARS Abstract Only
K. Ya. Kondratyev, N. I. Moskalenko, S. N. Parzhin, and S. Ya. Skvortsova *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 125 Transl. into ENGLISH from Izvestiya Akademii Nauk SSR: Fizika Atmosfery i Okeana (Moscow, USSR), v. 21, no. 5, May 1985 p 451-459 Original language document was announced in IAA as A85-40637 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20232# Joint Publications Research Service, Arlington, Va.
GLOBAL RESONANCE OF JOVIAN RADIATION BELTS

Abstract Only
P. A. Bespalov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 126 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 1, Jan. 1985 p 72-77 Original language document was announced in IAA as A85-48686 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20233# Joint Publications Research Service, Arlington, Va.
PRELIMINARY RESULTS OF DETERMINATIONS OF PHYSICAL PROPERTIES OF MICROFRAGMENTS OF LUNAR ROCKS FROM SOIL RETURNED BY LUNA-16 AND LUNA-20 STATIONS Abstract Only
G. I. Gorbunov, R. V. Medvedev, and V. V. Chashnikov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 126-127 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 283, no. 3, Jul. 1985 p 601-604 Original language document was announced in IAA as A85-48686 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20234# Joint Publications Research Service, Arlington, Va.
POLARIMETRIC STUDIES OF MOON AND PLANETS AT ABASTUMANI ASTROPHYSICAL OBSERVATORY Abstract Only
V. P. Dzhapiashvili, O. R. Bolvadze, O. I. Kvaratskheliya, A. N. Korol, and L. A. Sigua *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 127-128 Transl. into ENGLISH from Astronomicheskiy Vestnik (Moscow, USSR), v. 19, no. 1, Jan. - Mar. 1985 p 77-85 Original language document was announced in IAA as A86-11967 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N86-20282 Rochester Univ., N. Y.
UMBRAL OSCILLATIONS AS A PROBE OF SUNSPOT STRUCTURE Ph.D. Thesis
Toufik El-Hak Abdelatif 1985 229 p
Avail: Univ. Microfilms Order No. DA8516458

The interaction of the solar 5 minute oscillations with a sunspot was explored, both on observational and theoretical grounds. Simple theoretical models were developed to understand the observations of umbral oscillations. The 3 minute and 5 minute umbral oscillations at photospheric heights were detected. The 3 minute oscillations were found to have a kinetic energy density six times higher in the photosphere than in the chromosphere and to be concentrated in the central part of the umbra, supporting the photospheric resonance theory for the 3 minute umbral oscillations. The 5 minute oscillations are attenuated in the umbra, which appears to act as a filter in selecting some of the peaks in the power spectrum of 5-minute oscillations in the surrounding photosphere. The K-omega power spectrum of the umbral oscillations shows a shift of power to longer wavelengths. The variation of the transmission coefficient of trapped acoustic waves along the eigenmode curves is responsible for the selection of the peaks of the 5 minute oscillations. The wavelength shift, due to the different dispersion relations in the nonmagnetic region and the magnetic region, is responsible for the shift of power in the umbral k-omega power spectrum. Dissert. Abstr.

N86-20283*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLOBAL AURORAL RESPONSES TO MAGNETOSPHERIC COMPRESSIONS BY SHOCKS IN THE SOLAR WIND: TWO CASE STUDIES
J. D. Craven (Iowa Univ., Iowa City, Iowa), L. A. Frank (Iowa Univ., Iowa City, Iowa), C. T. Russell (California Univ., Los Angeles, Calif.), E. J. Smith (JPL, Pasadena, Calif.), and R. P. Lepping Apr. 1985 31 p Original contains color illustrations
(Contract N00014-76-C-0016)
(NASA-TM-88636; NAS 1.15:88636; AD-A161135; U-of-Iowa-85-11) Avail: NTIS HC A03/MF A01 CSCL 04A

Two case studies are presented of the global auroral responses to shocks in the solar wind at Earth. The z-component of the interplanetary magnetic field, Bz, is negative ahead and behind the first shock and positive for the second case. A sudden-commencement geomagnetic storm develops in each case, with maximum D sub st somewhat < 190 nT. An immediate auroral response is detected at all longitudes around the auroral oval, in which auroral luminosities increase by a factor of 2 to 3 with the first samples after each sudden commencement. The time delay in obtaining the first sample varies with local time from about 1 to 18 minutes. No other significant variations in the aurora are associated with the immediate response. Beginning about 30 minutes after each sudden commencement, the aurora becomes active and displays significant variations in its luminosity and spatial distribution. For $Bz < 0$ an intense substorm develops. a sun-aligned transpolar arc forms when $Bz > 0$, appearing first at local midnight as a polar arc and then lengthening sunward from the auroral oval across the polar cap to noon at an average speed of about 1 km/sec. GRA

N86-20284# Los Alamos National Lab., N. Mex.
UPPER LIMITS TO THE MASSES OF OBJECTS IN THE SOLAR COMET CLOUD
J. G. Hills 1985 5 p Presented at the 2nd Asteroids, Comets and Meteors Symposium, Uppsala, Sweden, 3 Jun. 1985
(Contract W-7405-eng-36)
(DE85-015713; LA-UR-85-2457; CONF-8506174-1) Avail: NTIS HC A02/MF A01

The lack of a large steady stream of long-period comes with semi-major axes less than 2 x 10 to the 4th power AU rules out the sun having a companion more massive than about 0.01 M/sub solar with a semi-major axis less than about 1 x 10 to the 4th power AU. Any companion with a semi-major axis between 1 x 10 to the 4th power AU and 5 x 10 to the 4th power AU has more than a 50% probability of having entered the planetary system during the lifetime of the Solar System. The lack of apparent damage to the planetary system rules out any companion more massive than about 0.02 M/sub solar with a semi-major axis less than about 5 x 10 to the 4th power AU. DOE

N86-20208# Joint Publications Research Service, Arlington, Va.
NUMERICAL MODELING OF INTERACTION BETWEEN SOLAR WIND AND COMETARY PLASMA Abstract Only
A. S. Lipatov *In its* USSR Report: Space (JPRS-USP-86-0010 13 Jan. 1986 p 100 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 158-166 Original language document was announced in IAA as A85-28498 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20215# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF PARAMETRIC APPROACH TO STUDY ON PREFLARE PHENOMENA IN SOLAR PLASMA BY ANALYSIS OF SOLAR RADIO EMISSION FLUCTUATIONS Abstract Only
Ye. A. Averyanikhina, M. M. Kobrin, and I. Ya. Orlov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 105-106 Transl. into ENGLISH from Izvestiya Vysshikh Uchebnykh Zavedeniy: Radiofizika (Gorkiy, USSR), v. 28, no. 1, Jan. 1985 p 3-10 Original language document was announced in IAA as A85-26726 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20216# Joint Publications Research Service, Arlington, Va.
EVALUATIONS OF EXTERNAL VALUES OF INTEGRAL PROTON FLUXES IN FLARES IN PLANNING OF SPACE FLIGHTS Abstract Only
A. Kolomenskiy *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 106 Transl. into ENGLISH from Kosmicheskiye

Issledovaniya (Moscow, USSR), v. 23, no. 2, Mar. - Apr. 1985 p 315-316 Original language document was announced in IAA as A85-35247 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N86-20285 Cornell Univ., Ithaca, N.Y.
FAR-INFRARED LINE EMISSION FROM THE GALAXY Ph.D. Thesis
Gordon John Stacey 1985 228 p Previously announced as N85-13702
Avail: Univ. Microfilms Order No. DA8504504

The diffuse 157.74 micron (CII) emission from the Galaxy was sampled at several galactic longitudes near the galactic plane including complete scan across the plane at (II) = 2.16 deg and (II) = 7.28 deg. The observed (CII) emission profiles follow closely the nearby (12)CO (J=1 to 0) emission profiles. The (CII) emission probably arises in neutral photodissociation regions near the edges of giant molecular clouds (GMC's). These regions have densities of approximately 350 cm(-3) and temperatures of approximately 300 K, and amount to 4x10(8) solar mass of hydrogen in the inner Galaxy. The total 157.74 micron luminosity of the Galaxy is estimated to be 6x10(7) solar luminosity. Estimates were also made of the galactic emission in other far-infrared (FIR) cooling lines. The (CII) line was found to be the dominant FIR emission line from the galaxy and the primary coolant for the warm neutral gas near the galactic plane. Other cooling lines predicted to be prominent in the galactic spectrum are discussed. The 145. 53 micron (OI) emission line from the Orion nebula was also measured. M.G.

N86-20286 Princeton Univ., N. J.
A TWO-DIMENSIONAL MODEL FOR RELATIVISTIC GAS JETS Ph.D. Thesis
Kevin William Thompson 1985 233 p
Avail: Univ. Microfilms Order No. DA8520752

Many extragalactic radio sources contain jets of plasma moving away from a central source at relativistic velocities. A two dimensional, cylindrically symmetric, relativistic hydrodynamics model was created to address the issue of jet stability. A description of the model is presented. The derivation of the relativistic fluid dynamics equations, in both conservative and characteristic forms, with specialization to the two dimensional, cylindrical problem is described. The grid and metric specification, the finite differencing, the time integration method, and linear stability theory are discussed. The general problem of boundary condition specification for hyperbolic systems of differential equations, in a space-time with any number of spatial coordinates, is analyzed. Boundary conditions for the relativistic fluid dynamics equations are given for the cylindrical case. Comparison of numerical and analytical solutions to test problems reveals that the numerical scheme represents shocks and smooth solutions properly, but allows excess diffusion at contact discontinjets, indicate that the beam boundary is stable, but that the cocoon boundary is unstable for low Mach number flows. The stability of the beam boundary may be due to excess numerical diffusion. Analytic solutions to the text problems, and the source code for the numerical model, are given.
Author

N86-20287# European Space Agency, Paris (France).
RECENT RESULTS ON CATACLYSMIC VARIABLES: THE IMPORTANCE OF IUE AND EXOSAT RESULTS ON CATACLYSMIC VARIABLES AND LOW-MASS X-RAY BINARIES
W. R. Burke, comp. Jun. 1985 311 p refs Workshop held in Bamberg, West Germany, 17-19 Apr. 1985
(ESA-SP-236; ISSN-0379-6566) Avail: NTIS HC A14/MF A01

Cataclysmic variable and low-mass X-ray binary star evolution; dwarf novae; accretion disks; symbiotic stars; AM Her stars; and IUE and EXOSAT results were discussed. For individual titles, see N86-20288 through N86-20340.

N86-20288# Cape Town Univ. (South Africa). Dept. of Astronomy.
NOVA REMNANTS **c90**
Brian Warner *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 1-6 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The brightest nova remnants and nova-like variables (which are possible candidates for membership of the class of nova remnants) are reviewed. Several nova remnants show multiple periodicities: V603 Aql, HR Del, CP Pup and possibly V1500 Cyg have differing photometric and spectroscopic periods. The cause of this is not known, but there is a similarity with the superhump phenomenon in SU UMa stars. The RR Pic shows changes in structure, 50 yr after the outburst. Author (ESA)

N86-20289# Academy of Sciences (USSR), Moscow. Astronomical Council.
EVOLUTION OF LOW MASS CLOSE BINARIES WITH ORBITAL MOMENTUM LOSSES **c90**
A. V. Tutukov and L. R. Yungelson *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 7-16 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The formation and evolution of low-mass (M2 < M1 < or = 1.5 solar mass) close binaries influenced by angular momentum loss by radiation of gravitational waves and magnetic stellar wind is reviewed. The frequency of formation of cataclysmic variables and low-mass X-ray sources is 0.005 and 0.00000003 per year, respectively. Results of evolutionary computations of secondaries are presented, which explain the existence of 2 to 3h orbital period gap, 80m minimal period, as well as the existence of unique ultrashort period systems with 15 sup m < or = P < or = 1 sup h. Author (ESA)

N86-20290# Ludwig-Maximilians-Universitaet, Munich (West Germany). Universitaets-Sternwarte.
THE MASS SPECTRUM OF THE WHITE DWARFS IN CATACLYSMIC BINARIES **c90**
H. Ritter and A. Burkert *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 17-20 refs (For primary document see N86-20287 10-93)
(Grant DFG-Ku-474/8-1)
Avail: NTIS HC A14/MF A01

Using a simple model for the secular evolution of cataclysmic binaries, the extent to which observations would select in favor of massive white dwarfs was investigated. Results show that the selection effect is strong enough to account for the high mean white dwarf mass observed, and that the intrinsic mass spectrum of the white dwarfs in cataclysmic binaries need not be significantly different from that of single white dwarfs. The main reason for the strong selection is found to be the strong dependence on mass of the white dwarf's gravitational potential. Only a very small fraction of the population of cataclysmic binaries is actually observed. Accordingly, the true space density of these objects must be much higher than inferred from observations.
Author (ESA)

N86-20291*# Arizona State Univ., Tempe. Dept. of Physics.
ON THE LONG TERM EVOLUTION OF WHITE DWARFS IN CATACLYSMIC VARIABLES AND THEIR RECURRENCE TIMES **c90**
E. M. Sion and S. G. Starrfield *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 21-23 refs (For primary document see N86-20287 10-93)
(Grants NAG5-343; NSF AST-81-171777; NSF AST-83-14788)

Avail: NTIS HC A14/MF A01 CSCL 03B

The relevance of the long term quasi-static evolution of accreting white dwarfs to the outbursts of Z Andromeda-like symbiotics; the masses and accretion rates of classical nova white dwarfs; and the observed properties of white dwarfs detected optically and with IUE in low M dot cataclysmic variables is discussed. A surface luminosity versus time plot for a massive, hot white dwarf bears a remarkable similarity to the outburst behavior of the hot blue source in Z Andromeda. The long term quasi-static models of hot accreting white dwarfs provide convenient constraints on the theoretically permissible parameters to give a dynamical (nova-like) outburst of classic white dwarfs. Author (ESA)

N86-20292# Technion - Israel Inst. of Engineering, Haifa. Dept. of Physics.

ON ACCRETION OF ANGULAR MOMENTUM FROM AN INHOMOGENEOUS MEDIUM **c90**

M. Livio, N. Soker, M. deKool (Amsterdam Univ., Netherlands), and G. J. Savonije (Amsterdam Univ., Netherlands) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 25-27 refs (For primary document see N86-20287 10-93)

Avail: NTIS HC A14/MF A01

Accretion onto a compact object from a medium containing a density gradient was studied. Using a three dimensional numerical calculation, it is shown that the mass accretion rate is very close to the Bondi-Hoyle value (when pressure effects are neglected). Only a few percent of the angular momentum deposited into the accretion cylinder are accreted by the compact object. This could have important consequences in the case of neutron stars and white dwarfs accreting from a stellar wind. Author (ESA)

N86-20293# Barcelona Univ. (Spain). Dept. de Fisica de la Tierra y del Cosmos.

THE COLLAPSE OF WHITE DWARFS: A POSSIBLE ORIGIN OF LOW-MASS X-RAY BINARIES **c90**

J. Labay, R. Canal (Inst. d'Estudis Catalans, Spain), E. GarciaBerro, M. Hernanz (Inst. d'Estudis Catalans, Spain), and J. Isern *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 29-32 refs (For primary document see N86-20287 10-93)

Avail: NTIS HC A14/MF A01

It is shown that if an accreting carbon-oxygen white dwarf is partially solid at the moment of the central ignition, the total disruption of the star may be avoided and the formation of a neutronized remnant ensured. The mass accreting carbon-oxygen white dwarfs could thus account for Type 1 supernovae and the presence of neutron stars in low-mass binaries. The parameter that determines the evolutionary outcome is the degree of chemical differentiation due to solidification before the accretion phase. Maximum separation leads to collapse, possibly without explosion, while partial separation leads to off-center carbon ignition and explosive burning of different amounts of the carbon-oxygen mixture. Even in this last case the formation of a bounded remnant, either a neutron star or a white dwarf, is not ruled out since the solid core would likely survive the explosion. But now, as the ejected matter is much greater, the binary system would probably be disrupted. Author (ESA)

N86-20294# Slovak Academy of Sciences, Tatranska Lomnica (Czechoslovakia). Inst. of Astronomy.

LONGTERM EVOLUTION OF OUTBURST ACTIVITY IN CATACLYSMIC VARIABLE STARS **c90**

Z. Urban *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 33-36 refs (For primary document see N86-20287 10-93)

Avail: NTIS HC A14/MF A01

It is suggested that the various forms of the outburst activity observed in cataclysmic variables can be interpreted as the more or less alternating phases of the more general outburst activity cycle which repeats many times during the secular evolution of these systems. A crucial role in determining the properties of a particular cycle is played by the energetics, speed class, recurrence time, and heating and cooling time of the classical nova outburst at the beginning and at the end of this cycle. Importance of the recurrent nova T Pyx and a possible significant role of magnetic fields in the evolution of the cataclysmic outburst activity are stressed. Computer codes devoted to the study of the long-term evolution of outburst activity in cataclysmics are described. Author (ESA)

N86-20295*# Washington Univ., Seattle.

MULTIFREQUENCY OBSERVATIONS OF DWARF NOVAE OUTBURSTS **c89**

Paula Szkody *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 39-45 refs Sponsored by ESA (For primary document see N86-20287 10-93)

(Grants NSG5-395; NSF AST-84-05923)

Avail: NTIS HC A14/MF A01 CSCL 03B

Studies using EXOSAT and IUE data combined with ground-based optical and IR photometry, spectroscopy and polarimetry of the transition timescales and physical properties of the high accretion rate states of the disks in cataclysmic variables are discussed. Implications for dwarf novae stem from comparison of the timing and amplitude of the optical and IR rise with that of the UV and X-ray; the development of the optical and UV line profile changes as the outburst develops; and the similarity of the outburst flux distributions in different systems and different types of outbursts (standstills and supermaxima). These features of dwarf novae outbursts present interesting comparisons with the outbursts of systems like TV Col and GK Per. Author (ESA)

N86-20296# Cambridge Univ. (England). Inst. of Astronomy.

ECLIPSE STUDIES OF DWARF NOVAE **c89**

Keith Horne *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 47-53 refs (For primary document see N86-20287 10-93)

Avail: NTIS HC A14/MF A01

Eclipses used for imaging studies of accretion disks in cataclysmic binaries are described. The light curves of eclipsing dwarf novae reveal the changes that occur in their disks over the course of the outburst cycle. These eclipse studies provide data with which to test models of the dwarf nova outburst. The assumptions that underly the widely discrepant mass determinations for these systems are examined. It is suggested that the most reliable method for estimating the masses employs the eclipse contacts of white dwarf and bright spot and the velocity separation of the emission peaks. Author (ESA)

N86-20297# Tasmania Univ., Hobart (Australia). Dept. of Physics.

SPECTROPHOTOMETRY OF THE ECLIPSING DWARF NOVAE V2051 OPHIUCHI **c89**

D. J. Watts, J. Bailey (Anglo-Australian Observatory, Sydney, Australia), P. W. Hill (St. Andrews Univ., Scotland), and J. G. Greenhill *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 55-59 refs (For primary document see N86-20287 10-93)

Avail: NTIS HC A14/MF A01

An optical and UV spectrophotometric study of the eclipsing dwarf nova V2051 Oph is presented. The optical and UV spectra are typical of a dwarf nova at quiescence. The observed semiamplitude K1=111 km/sec with a crossing at phase 0.13. This anomalous phase can be reproduced by an asymmetric disk with the trailing lune brighter by 60% than the leading lune. This yields a revised K1=91 km/sec and implies a white dwarf mass of 0.43 M and a companion of mass 0.11 M and radius 0.15 R. The UV to optical continuum can be well fitted by a steady-state optically thick disk model with a turnover at 2500A. If this is related to the maximum temperature of the accretion disk then the system parameters are: maximum disk temperature of 15,500K, M dot = 1.3 times 10 to the minus 10th power M/yr, and distance between 90 and 150 pc. Author (ESA)

N86-20298# Oxford Univ. (England). Dept. of Astrophysics.

THE THEORY AND OBSERVATION OF SUPERHUMPS IN SU UMA SYSTEMS **c89**

P. A. Charles, C. J. Clarke, G. T. Bath, R. Whitehurst, and J. Bailey (Anglo-Australian Observatory, Sydney, Australia) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 61-65

refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The superoutburst phenomenon of dwarf novae is discussed. The SU UMa subclass of dwarf novae exhibit normal outbursts and superoutbursts (duration 2 and 12 days respectively). The principal characteristic of superoutbursts is the presence of superhumps at a period 3% to 7% longer than P orb. Although generally agreed that superoutbursts are the result of an extended period of enhanced accretion, the location of the superhump light source and the mechanism of its formation is a matter of controversy. Photometric data for the eclipsing system Z Cha indicate that the superhump must either reside on the red component as a form of superspot or be an extended region of the accretion disk. Results from spectroscopy during the May 1984 Z Cha superoutburst allow both interpretations. It is shown the general appearance of the superhump can be explained by periodic mass transfer variations which would be expected in the eccentric binary model. Author (ESA)

N86-20299# Ludwig-Maximilians-Universitaet, Munich (West Germany). Universitaets-Sternwarte.
THE SPECTRAL ENERGY DISTRIBUTION OF STATIONARY ACCRETION DISKS IN CATACLYSMIC VARIABLES **c90**
A. Burkert and G. Hensler *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 67-71 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Rotational energy dissipation effects on cataclysmic variable models are discussed. In order to become accreted onto the primary in cataclysmic variables, the disk matter has to dissipate its excess rotational energy in a thin boundary layer (BL). Applying Pringle's BL model and assuming optically thick accretion, soft X-ray luminosities which are several orders brighter than those observed in many systems can be deduced. The influence of an ellipsoidal BL on the spectral energy distribution is investigated, including its dependence on the aspect angle. The BL thickness and reprocessing of the BL radiation over the disk surface are also taken into account. It is concluded that the BL geometry is between the vertically thin model of Pringle and the ellipsoidal BL. Author (ESA)

N86-20300*# Mount Stromlo and Siding Spring Observatory, Canberra (Australia).
OPTICAL OBSERVATIONS OF NEW X-RAY EMITTING CATACLYSMIC VARIABLES
I. R. Tuohy, D. A. H. Buckley, R. A. Remillard (MIT), H. V. Bradt (MIT), and D. A. Schwartz (Harvard Smithsonian Center for Astrophysics) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 73-76 refs Sponsored by US/Australia Bilateral Science and Technology Agreement and Smithsonian Institution Scholarly Studies Program (For primary document see N86-20287 10-93)
(Contracts NAS8-27972; NAS8-30453; Grants NAG8-493; NSF INT-82-11357)
Avail: NTIS HC A14/MF A01 CSCL 03B

Two X-ray emitting cataclysmic variables were discovered as a result of a program to identify faint X-ray sources located by the HEAO-A3 modulation collimator experiment. The objects, H0534-581 and 1H0542-407, have similar high excitation spectra with intense emission lines showing broad and narrow components. Photometry shows that H0534-581 and 1H0542-407 have average magnitudes of V=14.9 and 15.7 respectively, leading to Lx/Lopt ratios of 1.5 (typical of dwarf novae in quiescence). While pronounced variability of delta B > or = 1.5 mag is observed from both systems, there is no clear evidence for repeatable orbital periods between 1 and 4 hr. Author (ESA)

N86-20301# Osservatorio Astrofisico, Asiago (Italy).
PROBABLE ORBITAL PERIOD FOR THE OLD NOVA CP PUP (1942) BELOW THE CATACLYSMIC BINARY PERIOD GAP **c90**
A. Bianchini, M. Friedjung (Inst. d'Astrophysique, Paris, France), and F. Sabbadin *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 77-79 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Spectra of the old classical nova CP Pup(1942) were obtained with the IDS detector of the 1.5m ESO telescope. The observed rapid variations of radial velocity and equivalent width of emission lines indicate a very short orbital period of the order of 0.06 days. This is better defined from line peak than line baricenter. A secondary 0.04 day period might exist. Author (ESA)

N86-20302# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Dept. fuer Astrophysik.
ACCRETION DISK INSTABILITIES **c90**
Friedrich Meyer *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 83-89 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The accretion disk outburst theory based on unstable stationary mass accretion in regions of partial ionization and convection is discussed. Observations of dwarf novae yield support when compared to time dependent model calculations. Apparent contradictions are rather constraints on unknown free parameters in the theoretical models. Observed features of dwarf novae outbursts indicate that alpha should be lower in cold than in hot regions. For reliable theoretical results the structure of transition fronts should be resolved. Quantitative theoretical progress is limited by the unknown frictional process; the difficulty to reliably model the thermally nonrelaxed transition between cold and hot states in presence of a large radial gradient; by imperfect treatment of disk atmospheres and optically thin regions; and by imperfect knowledge of opacities for very cool gas. It is shown that self-irradiations in accretion disks around neutron stars suppress the thermal instability but can lead to nonlinear mass flow variations on the long diffusive timescale, relevant for low mass X-ray binaries. Author (ESA)

N86-20303# Crimean Astrophysical Observatory (USSR).
SYMBIOTIC STARS **c90**
A. A. Boyarchuk *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 97-100 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Hypotheses on the nature of symbiotic stars are discussed. Arguments for binary nature of symbiotic stars are presented. Hot components of symbiotic stars are located on the temperature-luminosity diagram as the central stars of planetary nebulae. Author (ESA)

N86-20304# Nicolaus Copernicus Univ., Torun (Poland). Inst. of Astronomy.
ON THE NATURE OF CI CYGNI **c90**
J. Mikolaejewska *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 101-104 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Secular and eclipse variations of CI Cyg optical emission lines during 1979-1984 are presented. Hydrogen and helium lines show pronounced but nontotal eclipse effects while forbidden lines do not show such effects. This suggests that these lines are produced in different parts of the nebula. The physical and geometrical parameters of the line formation regions are determined. The parameters characterizing the boundary layer (T = 100,000 to 150,000 K, L = 1000 to 2000) responsible for the excitation and ionization in the nebula and the accretion rate are estimated. Author (ESA)

N86-20305# Nicolaus Copernicus Univ., Torun (Poland). Inst. of Astronomy.
THE H-BETA AND H-GAMMA PROFILES IN CH CYGNI DURING THE RECENT DROP OF BRIGHTNESS **c89**
M. Mikolaejewski and R. Biernikowicz *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 105-108 refs (For primary document see N86-20287 10-93)

Avail: NTIS HC A14/MF A01

Observations of H-beta and H-gamma profiles in CH Cygni during 1982-84 are presented. The profiles consist of two emission peaks (V>R) cut by sharp absorption. Sudden changes in the radial velocities and intensities of H-beta and H-gamma profile components as well as a drop of continuum are observed since mid-1984. The binary model of CH Cygni and possibility of occurrence of eclipses in this system are considered. Observational data are insufficient to distinguish between single and binary star models. Author (ESA)

N86-20306# Tel-Aviv Univ. (Israel). Wise Observatory.
THE AG DRA: A CASE OF A STELLAR WIND ACCRETOR **c90**

E. M. Leibowitz, L. Formiggini, and H. Netzer *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 109-112 refs Sponsored by Israel Academy of Sciences (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Optical observations of the symbiotic star AG Dra indicate the presence of an accretion luminous disk in the system. The disk is fed by stellar wind from the cool component in the system. The binary revolution of the hot component within the nontransparent wind may account for the observed optical light curve of the system in the U, B and V photometric bands. Author (ESA)

N86-20307# Academy of Sciences (USSR), Moscow. Astronomical Council.
THE SYMBIOTIC NOVA PU VUL **c90**

B. M. Shustov and A. V. Tutukov *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 113-115 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

An evolutionary scenario for PU Vul (Kuwano-Honda object) behavior beginning from 1978 is discussed. The star is identified as a very slow nova. It passed through phases of outburst, almost constant brightness with small amplitude quasiperiodic oscillations, and expansion of the dusty envelope. Author (ESA)

N86-20308# European Space Agency. European Space Operations Center, Darmstadt (West Germany). EXOSAT Observatory.
THE EXO 0748-676: AN EXCITING NEW X-RAY TRANSIENT

A. N. Parmar, M. Gottwald, F. Haberl, P. Giommi, and N. E. White *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 119-122 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The results of EXOSAT observations of the X-ray transient EXO 0748-676 are presented. This source shows X-ray eclipses, irregular intensity dips, and X-ray bursts. The eclipses last for 8.3 min and recur with a period of 3.8 hr. The intensity dips occur between phases 0.5 and 0.1 (where center of eclipse is 0.0) and are associated with an increase in low energy absorption. As the intensity of EXO 0748-676 decayed by a factor 2 over an interval of 50 days the shape of the 2 to 10 keV light curve changed such that the dips were centered on phase 0.0. In addition to 18 single type 1 bursts, 3 double X-ray bursts are observed. The luminosity of the second burst in a pair is 0.3 of the first. The rise and decay times of the second bursts appear to be more rapid than the first bursts. Author (ESA)

N86-20309# European Space Agency. European Space Operations Center, Darmstadt (West Germany). EXOSAT Observatory.
THE SPECTRAL AND TEMPORAL VARIABILITY OF GX 13+1 **c89**

L. Stella, N. E. White, and B. G. Taylor (ESA/ESTEC, Noordwijk, Netherlands) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 125-128 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The results of an EXOSAT observation of the bright galactic bulge X-ray source GX 13+1 are reported. Short term aperiodic variability with characteristic timescales of 1sec, similar to that observed from the black hole candidate Cyg X-1, is found. The spectrum consists of 2 components and displays 2 different types of intensity correlated spectral changes, the transition between the 2 modes occurring in 1hr. The source is compared with other galactic bulge X-ray sources and with the black hole candidates in their high state. Author (ESA)

N86-20310# Leicester Univ. (England). Dept. of Astronomy.
ACCRETION PROCESSES IN THE MAGNETIC CATACLYSMIC VARIABLES **c90**

A. R. King *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 133-138 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Accretion processes in magnetic cataclysmic variables are reviewed. The evolutionary status of the synchronous and nonsynchronous systems is discussed, as are the system geometries and their hard and soft X-ray emission. It is argued that accretion disks may not form in nonsynchronous (intermediate polar) systems with orbital periods < or = 5 hr. Author (ESA)

N86-20311# Anglo-Australian Observatory, Sydney.
MULTIWAVELENGTH OBSERVATIONS OF AM HERCULIS TYPE BINARIES

Jeremy Bailey *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 139-149 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Observational data on the 10 AM Her type binaries are compared with models. The origin of the components of the radiation observed from such objects is discussed. Multiwavelength photometry and polarimetry of AM Her systems in the optical and near IR in conjunction with models of the cyclotron emission can be used to constrain the temperature, size, and shape of the emission region. The data require temperatures of order 20keV indicating that cyclotron radiation is produced in the shock heated region and not in cooler preshock regions, and indicate small flat emitting regions with diameter 10 times the height. Such observations can also yield information on the temperature structure within the emitting region. Author (ESA)

N86-20312# Amsterdam Univ. (Netherlands). Inst. of Astronomy.
SPIN UP OF THE WHITE DWARF IN THE INTERMEDIATE POLAR AO PSC/H2252-035

J. vanParadijs, H. Kraakman, S. vanAmerongen, E. Damen, and H. Tjemkes *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 151-153 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

From photometric observations of AO Psc/H2252-035, made with the 90 cm telescope at ESO, times of maximum light for the orbital and the 2 puisational light curve are derived. Combining these with previous values reveals that both pulse periods show a secular decrease. The spin-up rate of the white dwarf equals -6.6 +or- 1.1 10 to the minus 11th power 10-11, in good agreement with the prediction of Lamb and Patterson (1983) for an accreting magnetized white dwarf, rotating near its equilibrium period. However, the inferred low value of the white-dwarf magnetic field is in conflict with the conclusion of King, Frank and Ritter (1985), that there is no systematic difference between the white-dwarf magnetic fields in polars and intermediate polars. Author (ESA)

N86-20313# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
ORBITAL AND FAST VARIABILITY OF THE AM-HER SYSTEM H1405-45 IN THE X-RAY AND OPTICAL RANGES

J. M. Bonnet-Bidaud, K. Beuermann (Technische Univ., Berlin, West Germany), P. A. Charles (Oxford Univ., England), L. Maraschi (Milan Univ., Italy), C. Motch (Observatoire de Besancon, France), M. Mouchet (Observatoire Paris-Meudon, France), J. P. Osborne (ESOC, Darmstadt, West Germany), E. Janzi (CNR, Milan, Italy), and A. Treves (Milan Univ., Italy) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 155-159 refs (For primary

document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Simultaneous X-ray and optical observations of the magnetic white dwarf binary H1405-45 are presented. The orbital modulation at the period of 101 min is clearly observed in soft and hard X-rays with EXOSAT as well as from 0.4 to 2.2 mu. The soft, optical, and infrared light curves show a pronounced minimum at the same phase, while the hard X-rays present a roughly correlated maximum. Fast optical photometry, obtained simultaneously with EXOSAT, reveals the presence of variable (0.3 to 0.7 Hz) fast oscillations. Searches for an X-ray counterpart of these oscillations are inconclusive. The temporal and spectral characteristics of the light modulation in H1405-45 favor a two-poles model similar to AM-Her. The shift of the accretion from one pole to the other could possibly explain the phase jitters observed in both sources.
Author (ESA)

N86-20314# European Space Agency. European Space Operations Center, Darmstadt (West Germany). EXOSAT Observatory.
X-RAY, OPTICAL AND UV OBSERVATIONS OF THE AM HER OBJECT E2003+225
J. P. Osborne, K. Mukai (Oxford Univ., England), J. M. Bonnet-Bidaud (CEA, Saclay, France), P. A. Charles (Oxford Univ., England), R. Corbet (Oxford Univ., England), P. Henry (Hawaii Univ.), G. Hill (Hawaii Univ.), S. Kahn (California Univ., Berkeley), M. vanDerklis (ESA/ESTEC, Noordwijk, Netherlands), L. Maraschi (Milan Univ., Italy) et al *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 161-165 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Quasi-simultaneous EXOSAT, low resolution spectrophotometric optical, and IUE observations of the AM Her object E2003=225 made in October 1983, and simultaneous high resolution optical and phase-resolved IUE observations made in July 1984 are presented. The soft X-ray light curve shows two maxima per orbital period and two eclipses. The EXOSAT 500 1/mm grating observation limits the blackbody temperature to 18 to 29 eV. The blackbody luminosity exceeds the bremsstrahlung luminosity by a least a factor of 2.3, in contradiction to standard accretion models. In July 1984 systemic velocity = -30 Km/sec for all line components (previous observations) show 300 to 500 Km/sec). Optical minimum and soft X-ray eclipse occur at dia = 0.3, previous observations showed optical minimum at 0.4.
Author (ESA)

N86-20315# Observatoire de Paris-Meudon (France). Dept. d'Astrophysique Fondamentale.
X-RAY ILLUMINATION IN CATACLYSMIC VARIABLES AND LOW MASS X-RAY BINARIES
J. M. Hameury, A. R. King, and J. P. Lasota *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 167-168 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Models for mass transfer variations in cataclysmic variables and soft X-ray transients which involve X-ray illumination of the companion star are examined. It is concluded that models are unable to give limit cycle behavior on the observed time scales.
Author (ESA)

N86-20316# Leicester Univ. (England). X-Ray Astronomy Group.
THE EF ERI: STRUCTURE OF THE X-RAY LIGHT CURVE
M. G. Watson, A. R. King, G. Williams, J. Heise (Space Research Lab., Utrecht, Netherlands), and K. Beuermann (Technische Univ., Berlin, West Germany) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 169-172 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The EXOSAT observations of the AM-Her System EF Eri which cover over 3 cycles of the 81 min binary period are presented. It is shown that the EXOSAT observations require a specific polecap geometry to explain the hard X-ray light curve. Geometrical constraints from polarization data are only consistent with interpretations of the origin of the hard X-ray light curve for polecap sizes f = 0.01, somewhat larger than usually assumed for polars. The soft X-ray light curve arises in a similar manner but its structure is dominated by phase dependent absorption which arises in the accretion flow close to the polecap. The prominent dip occurring at phase 0.45 in soft and hard X-ray light curves is probably due to obscuration by the accretion stream at large distances from the white dwarf. The occurrence of this dip before phase 0.5 indicates that the gas stream does not follow the field lines all the way from the L1 point to the white dwarf.
Author (ESA)

N86-20317# Technische Univ., Berlin (West Germany). Inst. fuer Astronomie und Astrophysik.
GEOMETRY AND MAGNETIC FIELD OF THE AM HER STAR H0139-68
A. Schwope and K. Beuermann *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 173-174 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Results of X-ray and optical observations of the AM Her star H0139-68 during its low state at V = 17 to 18 are reported. The data are consistent with accretion onto one active pole. The most probable geometry of the system is characterized by an inclination of i = 25 deg, and a magnetic colatitude of 98 deg. Spectrophometry reveals Zeeman absorption features near H alpha and H beta. For a dipole field, the implied polar field strength is 39 MG.
Author (ESA)

N86-20318# Max-Planck-Inst. fuer Extraterrestrische Physik, Garching (West Germany).
X-RAY OBSERVATIONS OF CLASSICAL NOVAE DURING THE OUTBURST STAGE BY EXOSAT
Hakki Oegelman, Klaus Beuermann, and Joachim Krautter (Landessternwarte Koenigstuhl, Heidelberg, West Germany) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 177-179 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Soft X-ray observations of Nova Mus 83 and Nova Vul 84(1) by EXOSAT are described. Nova Mus 83 continues to emit X-rays 18 and 23 months after the outburst at the same intensity as the original observation 15 months after outburst. Nova Vul 84(1) was observed at optical maximum and not detected; a second observation three months later yields a 2 sigma signal. The results are discussed in terms of the possible origin of the X-rays. A hot white dwarf model is suggested.
Author (ESA)

N86-20319# Institut d'Astrophysique, Paris (France).
THE ORIGIN OF THE PRINCIPAL SYSTEM AND THE PRESENCE OF VERY HOT REGIONS OF NOVAE
M. Friedjung *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 181-182 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Collisions between high velocity material nearer the center of a nova envelope during outburst, and slower moving material further out are discussed. Within the framework of continued ejection models, the theory is similar to that for the interaction of stellar winds with the interstellar medium. The principal velocity system, which eventually contains most of the envelope mass, could be due to a shell formed by the collision of a continuously ejected wind with material ejected before maximum light. Hot gas would be formed as a result of collision from about 10 days after maximum light onwards, and could sometimes contribute significantly to the production of coronal emission lines and X ray emission.
Author (ESA)

N86-20320# Indian Inst. of Astrophysics, Bangalore.
SPECTROPHOTOMETRY OF NOVA VULPECULAE 1984-1 c89
B. S. Shylaja *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 183-185 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The spectrophotometric observations of the nova Vulpeculae,

1984-1 obtained in September 84 are reported. Emissions were identified and compared with other novae. The nova appears to be in early decline phase and falls into the category of slow novae. Author (ESA)

N86-20321# Observatoire de Haute Provence, Forcalquier (France).
NOVA VULPECULAE 1984-2 NEAR THE MAXIMUM OF LIGHT
Y. Andrillat and L. Houziaux (Mons Univ., Belgium) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 187-191 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The spectra of Nova Vul 1984-2 are discussed. They are like the spectra of other novae near maximum of light, but Nova Vul 1984-2 is a typical slow nova. The most unusual spectroscopic feature of this nova seems to be the relative strength of Mg II and Mg I lines. As turbulent mixing between the white dwarf and the accreted material can lead to CNO enrichments, such a mixing of core matter can explain the overabundance of Mg if one assumes a massive O-Ne-Mg white dwarf. Author (ESA)

N86-20322*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Lab. for Astronomy and Solar Physics.
FUTURE ULTRAVIOLET OBSERVATIONS FROM SPACE
Yoji Kondo *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 193-194 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Astronomical facilities to observe from space in the ultraviolet are reviewed. For the immediate future, IUE and the extreme ultraviolet spectrometers of Voyager 1 and Voyager 2 are available for furthering knowledge of cataclysmic variables. The Hubble Space telescope is scheduled for launch in 1986 and will be available to guest observers. The Far Ultraviolet Spectroscopic Explorer, which is expected to provide the capability to observe in the far and extreme ultraviolet, is planned for launch in the 1990s. Author (ESA)

N86-20323# Observatoire de Paris-Meudon (France). Dept. d'Astrophysique Fondamentale.
BUGS IN THE METHODS FOR DETERMINING THE EFFECTIVE TEMPERATURES OF IONIZING STARS IN SYMBIOTICS AND NOVAE c89
R. Tylenda and G. Stasinska *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 197-199 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Using models of photoionized nebulae, methods for determining the effective temperatures of ionizing stars in symbiotics and novae in the nebular stage were tested. It is found that the methods seriously underestimate the stellar temperatures for Teff > 150,000 K. It is suggested that symbiotics and novae may possess stars much hotter than the value of 150,000 K quoted in the literature. This agrees with the theory of these objects which predicts that the white dwarfs after a nova-like outburst should go through a phase of very high effective temperatures. Author (ESA)

N86-20324# Nicolaus Copernicus Univ., Torun (Poland). Inst. of Astronomy.
BALMER LINE PROFILES DURING THE 1975 ECLIPSE OF CI CYGNI
J. Mikolajewska and M. Mikolajewski *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 201-203 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Balmer line profile variations of CI Cygni during the initial phase of 1975 eclipse were analyzed. The eclipse in Balmer series starts before the first contact of the V light curve. Variations of H-beta and H-delta profiles during the eclipse ingress suggest that a rotating and possibly expanding ring is eclipsed. Author (ESA)

N86-20325# Osservatorio Astronomico, Turin (Italy).
THE NEBULAR PHASE OF THE OUTBURST OF CH CYG
P. L. Selvelli and M. Hack *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 207-211 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The IUE observations of CH Cyg show that the UV continuum is very weak and completely flat, and that the line spectrum is dominated by numerous and strong emissions. A wide ionization range exists, indicating stratification in the ionization conditions. The width of the emissions increases with ionization, irrespective of the permitted or semiforbidden character of the transmission. A decrease in the density of the line emitting region is indicated by the appearance of the [CIII] lambda 1906.7 emission. The observations clearly indicate that the outburst started in 1977 is nearly ended. Author (ESA)

N86-20326# Remeis Sternwarte, Bamberg (West Germany).
THE STRUCTURE OF THE CATACLYSMIC VARIABLE GD 1401
I. Bues *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 215-216 ref (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Spectra of GD 1401, a faint (V = 14 m.4) apparently cataclysmic object are presented. The generally accepted model for novalike systems fails to explain the stong Balmer lines in absorption at all phases. A nonstandard model, where the accretion disk is optically thin in the visible region of the spectrum is proposed. The main contribution of the flux is provided by a white dwarf of spectral type DA; the emission components at certain phases are due to hot regions in the disk, or in the outermost layers of the white dwarf. Author (ESA)

N86-20327# Ludwig-Maximilians-Universitaet, Munich (West Germany). Universitaets-Sternwarte.
SYNTHETIC SPECTRA OF DWARF NOVA DISKS
C. laDous *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 217-220 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Applying codes for stellar atmosphere computation, the ultraviolet and optical spectra of accretion disks in cataclysmic variables are investigated with assumed parameter sets characteristic of dwarf novae. As few and as simple assumptions as possible are made. The influence of the input parameters (mass, angle of inclination, assumed size, geometrical height) on the wavelength dependence of the radiation in optical and ultraviolet wavelengths is discussed. Author (ESA)

N86-20328# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany).
THE 3000 SEC X-RAY VARIATIONS OF GK PER: EVIDENCE FOR TRANSITION FRONTS IN THE INNER ACCRETION DISK
W. J. Duschl, E. Meyer-Hofmeister, and F. Meyer *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 221-222 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The 3000 sec modulation of the X-ray light curve of GK Per in the 1983 outburst is discussed. It is suggested that the timescale of running accretion fronts in the limited region lies between the thermal timescale and the diffusion timescale through the disk. The small instable region contributes only very little to the optical light (of order 1/100). The observed modulation of the optical light by 5% to 8% over 3000 sec could be understood as an effect of disk irradiation which varies with the central mass flow. Author (ESA)

N86-20329# Universidad Complutense, Madrid (Spain). Dept. de Astrofisica.
THE ULTRAVIOLET BEHAVIOR OF Z ANDROMEDAE DURING QUIESCENCE AND OUTBURST
T. Fernandez-Castro, A. Gimenez, M. Friedjung (Inst. d'Astrophysique, Paris, France), A. Cassatella (ESA, Madrid, Spain), and R.

Viotti *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 225-227 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The UV variability of Z Andromedae symbiotic stars was monitored by IUE. Results show that the observed UV-near Ir energy distribution can be accounted for by three components: a latetype giant star, responsible for the observed flux in the near IR; a compact object providing the observed spectrum in the far-UV; and an extended nebular region giving rise to gas recombination continuum and emission lines. Author (ESA)

N86-20330# Institut d'Astrophysique, Paris (France).
NOVA EXPLOSION ON OXYGEN NEON MAGNESIUM WHITE DWARFS
P. Delbourgo-Salvador, R. Mochkovitch, and E. Vangioni-Flam *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 229-232 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Nova explosions in cataclysmic variables containing an oxygen neon magnesium white dwarf are considered. It is shown that these systems might contribute to a non negligible fraction of the observed classical nova outbursts. Using a simple model, the time evolution of bolometric luminosity, effective temperature, and temperature and density at the bottom of the accreted layer during one outburst are calculated. The consequences of shear mixing between the accreted layer and the white dwarf material are investigated in relation with observations of 2 neon enriched novae (Nova V 693 CrA 1981 and Nova Aql 1982). Nucleosynthesis in such objects is discussed. Author (ESA)

N86-20331# Erlangen-Nuremberg Univ. (West Germany). Inst. of Astronomy.
CONTINUUM AND LINE PROFILE VARIATIONS OF THE NOVA-LIKE SYSTEM V3885 SGR **c89**
K. Haug and H. Drechsel *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 233-236 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Optical spectroscopic measurements with high time resolution of the UX UMa-type system cataclysmic variable V3885 Sgr (= CD -42 deg 14462) were obtained in 1982 and 1983. The spectra are characterized by very broad (FWHM = 3000 km/sec) and shallow Balmer absorption lines with superimposed complex emission components. In 2 spectra of 1982, the H beta line exhibits a marked P Cygni profile shape and spectral features of TiO bands can be detected. The continuum fluxes and the complex Balmer emission features show phase-dependent intensity variations. The flux modulations can be interpreted by short term eclipses of the disk by the secondary component and by a variable line of sight aspect of an extended bright spot region on the following side of the accretion disk. Author (ESA)

N86-20332# Osservatorio Astrofisico, Asiago (Italy).
ULTRAVIOLET AND OPTICAL OBSERVATIONS OF THE INTERMEDIATE POLAR 3A 0729+103 **c89**
R. Falomo, P. A. Charles (Oxford Univ., England), R. Corbet (Oxford Univ., England), L. Maraschi (Milan Univ., Italy), G. Tagliaferri (Milan Univ., Italy), E. G. Tanzi (CNR, Milan, Italy), and A. Treves (Milan Univ., Italy) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 239-243 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The Ariel V X-ray source 3A 0729 + 103 was observed by IUE at 1200 to 3200A, and by quasi simultaneous optical spectrophotometry at 5300 to 7000 A. The overall energy distribution is similar to that of other intermediate polars, but reaches a maximum at 1200A. Temperature = 60,000 K, as opposed to reported values of 150,000 to 200,000 K for other polars. This is due to a smaller ratio of the outer to the inner radius of the disk (17, as opposed to 50 to 80 for other polars). Author (ESA)

N86-20333# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
FIVE-COLOR POLARIMETRY OF AM HERCULIS **c89**
V. Piirola, O. Vilhu, J. Kyroelaeinen, N. Shakhovskoi (Crimean Astrophysical Lab., USSR), and Y. Fimov (Crimean Astrophysical Lab., USSR) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 245-249 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Simultaneous UBVRI polarimetric and photometric observations, carried out in June 1984, on the cataclysmic variable AM Her are reported. They show a broad linear polarization pulse (or 2 overlapping spikes) and the inclination 35 to 40 deg can be derived from the phase dependence of the position angle. The latitude of the magnetic pole (= 5 to 65 deg) depends on wavelength, if derived from the 2 subsequent crossovers of the circular polarization. The observations are compared with the warm (< 1keV) magnetoactive plasma computations above the hot (> or = 20 keV) shock-heated region. To explain better the wavelength dependence of the polarization curves, new physical processes and/or new ranges of the model parameters should be included in the plasma computations. However, the overall shape of the orbital phase dependent variations seems to be adequately explained by the changing viewing angle between the line of sight and the magnetic field lines. Author (ESA)

N86-20334# Tuebingen Univ. (West Germany). Inst. fuer Astronomie.
ON THE 4-DAY PHASE-DEPENDENCE OF THE 5.2 HOUR PHOTOMETRIC MAXIMA AND MINIMA IN THE INTERMEDIATE POLAR TV COLUMBA
D. J. Watts *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 251-253 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The light curve of cataclysmic variable TV Col (2A0526 328) is discussed. Its spectroscopic period (5.5 hr) is different from its short photometric period of 5.2 hr. The beat period between the 2 shorter periods is also present as a 4.024 day photometric variation. The phase shifts of the 5.2 hr photometric period over the 4 day photometric cycle are shown to be reproducable by the addition of the weaker photometric moculation at the orbital period of 5.5 hr. Author (ESA)

N86-20335# Tuebingen Univ. (West Germany). Inst. fuer Astronomie.
SOME COMMENTS ON THE ANOMALOUS RADIAL VELOCITY PHASE SHIFTS IN CATACLYSMIC VARIABLES
D. J. Watts *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 255-258 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Brightness asymmetry in the accretion disks of cataclysmic variables are discussed. In several cataclysmic variables, the phase of superior conjunction as determined by radial velocity measurements is later than conjunctions determined by eclipse timings and/or the phase of inferior conjunction from the absorption lines of secondaries. These shifts are explained as a result of the gas stream from secondary penetrating deeply in the disk and causing asymmetries in the distribution of emission. Author (ESA)

N86-20336# Tuebingen Univ. (West Germany). Inst. fuer Astronomie.
SPECTRAL AND INFRARED DIFFERENCES BETWEEN NOVA-LINKS AND DWARF NOVAE **c89**
D. J. Watts *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 259-262 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Differences between nova-like systems and dwarf nova are compared using the emission lines and infrared colors as a discriminant. The comparison using spectral lines clearly separates different classes of cataclysmic variables. Most nova-likes occupy

the region near the line that describes the polars and intermediate polars indicating very similar ionization conditions. Several nova-likes are located within the dwarf novae region. Infrared data show that nova-likes tend to be redder than dwarf novae. Author (ESA)

N86-20337# Consiglio Nazionale delle Ricerche, Frascati (Italy). Inst. di Astrofisica Spaziale.
THE EXOSAT OBSERVATIONS OF THE X-RAY SOURCE IN THE GLOBULAR CLUSTER TERZAN 2
B. M. Belli, F. DAntona, D. Molteni (Osservatorio Astronomico, Rome, Italy), and M. Morini (CNR, Palerma, Italy) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 263-265 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The Globular Cluster X-ray source 4U1722-30 was observed with EXOSAT on 1985 March 14. The observed spectrum and the luminosity, 3.8 times 10 to the 36th power erg/sec, are consistent with Einstein observations of this source. No long term or burst temporal variability are apparent during the 11 hr of observation, but shot noise with typical time scale of 3.5 sec is revealed by autocorrelation analysis. The result is relevant in the context of the models proposed for accretion disks around the compact component in interacting binary systems. Author (ESA)

N86-20338# Ceskoslovenska Akademie Ved, Ondrejov. Inst. of Astronomy.
VERY LONG-TERM PHOTOMETRY OF HZ HER=HER X-1 AND V1727 CYG=4U2127+47: ACTIVE AND INACTIVE STATES
c89
R. Hudec, W. Wenzel (Academy of Sciences, Sonneberg, East Germany), W. Goetz (Academy of Sciences, Sonneberg, East Germany), G. Richter (Academy of Sciences, Sonneberg, East Germany), H. Huth (Academy of Sciences, Sonneberg, East Germany), and J. Drbohlav (Rtyne Observatory, Poland) *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 267-271 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Very long-term photographic monitoring of X-ray binary systems HZ Her=Her X-1 and V1727 Cyg=4U 2127+47 provided data on their long-term evolution and behavior. The long-term behavior of both objects is similar, showing drastic changes of luminosity between active and inactive states, suggesting that the physical properties of both systems are analogous. The significance of long-term optical monitoring in X-ray astronomy is discussed.
Author (ESA)

N86-20339# European Space Agency. ESA Tracking Station, Madrid (Spain). IUE Observatory.
ULTRAVIOLET OBSERVATIONS OF THE RECURRENT NOVA RS OPH IN OUTBURST
A. Cassatella, B. J. M. Hassall, A. Harris (Science Research Council, Chilton, England), and M. A. J. Snijders (Royal Greenwich Observatory, Hailsham, England) *In its* Recent Results on Cataclysmic Variables Jun. 1985 p 281-284 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

Results of UV monitoring by IUE of the recurrent nova RS Oph during the first 3 months after its outburst (Jan 1985) are reported, and compared with UV spectra at quiescence. The object is rather heavily reddened. Its distance is estimated as 1.3 Kpc. The decline phase is characterized by an increase of the degree of ionization and by a decrease of the electron density in the ejecta. Forbidden emission lines from FeXI and FeXII are detected in the IUE spectra taken in the later stages of the decline. High resolution IUE spectra show complicated emission line profiles, potentially important to study the dynamics of the ejection and the geometry of the system. Author (ESA)

N86-20340# Astronomical Research Ltd. (New Zealand).
THE SU UMA TYPE DWARF NOVA TU MENSAE
Frank M. Bateson *In* ESA Recent Results on Cataclysmic Variables Jun. 1985 p 287-288 refs (For primary document see N86-20287 10-93)
Avail: NTIS HC A14/MF A01

The optical behavior of TU Mensae, a southern dwarf nova of the SU Uma subgroup, the past two decades is outlined. It is suggested that the nature of its variations changed with time, and that it warrants closer photoelectric observations. Author (ESA)

N86-20189# Joint Publications Research Service, Arlington, Va.
OPTICAL RADIATION AND RADIO EMISSION ACCOMPANYING COSMIC GAMMA BURSTS Abstract Only
N. N. Vzorov, L. P. Gorbachev, A. Yu. Matronchik, and K. S. Mozgov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 85-86 Transl. into ENGLISH from Pisma v Astronomicheskiy Zhurnal (Moscow, USSR), v. 11, no. 6, Jun. 1985 p 444-447 (For primary document see N86-20178 10-88)
Avail: NTIS HC A03

N86-20205# Joint Publications Research Service, Arlington, Va.
DYNAMICS AND PREDICTION OF RADIATION CHARACTERISTICS OF SOLAR COSMIC RAYS Abstract Only
V. V. Bengin, L. I. Miroshnichenko, and V. M. Petrov *In its* USSR Report: Space (JPRS-USP-86-001) 13 Jan. 1986 p 98 Transl. into ENGLISH from Kosmicheskiye Issledovaniya (Moscow, USSR), v. 23, no. 1, Jan. - Feb. 1985 p 123-133 Original language document was announced in IAA as A85-28494 (For primary document see N86-20178 10-88)
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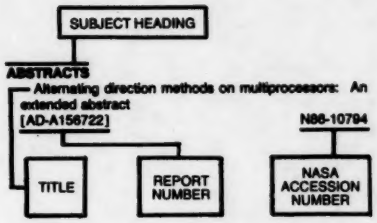

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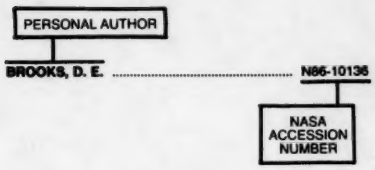

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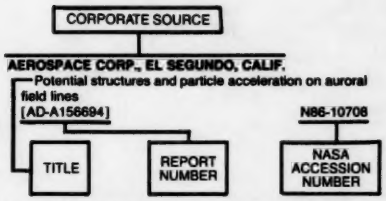

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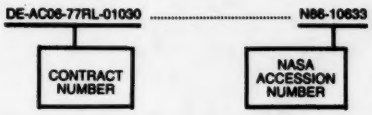

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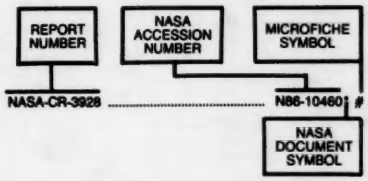

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